The Greatest Preventive Medicine Doctors Who Ever Lived:
The Arab Physicians during the Golden Era of the Arab Civilization

by
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Rhazes, one of the greatest Arab physicians, attends to a sick child.

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PREFACE

This book, *The Greatest Preventive Medicine Doctors Who Ever Lived: The Arab Physicians during the Golden Era of the Arab Civilization*, is the culmination of years of research. Its creation was inspired by: 1) the author's personal interest in the Arab Civilization of medieval times and its significant contributions to all fields of knowledge; 2) the author's recognition that trends run in cycles, and that the growing interest in employing preventive medicine and wholistic health approaches to the maintenance of health and treatment of diseases is not a new development but rather a return to a long-ago starting point; 3) the author's belief that one can profit from good examples set by others, and that one will more readily adopt such beneficial lifestyles, habits, diets, etc. if one understands that these have worked since ancient times and are not simply the latest craze.

This book is also an outgrowth of the author's doctoral dissertation, titled *The Arab Physicians and the Golden Era of Preventive Medicine*, completed in partial fulfillment of the requirements for the Doctor of Naturopathy degree awarded to him by Bernadean University. Several rare works were consulted in the process of researching the dissertation and this book. These sources are listed in the footnotes appearing in the back of this book.

Two distinct sections comprise this book. The first section introduces you to the most famous and accomplished Arab or Arabized physicians who practiced medicine during the Arab Civilization's golden era, which beginning in 680 CE ran approximately for 600 years. The lives and teachings of such medical and intellectual giants as Rhazes, Avicenna, Ibn Zuhr, and Maimonides are explored in depth. It will be shown how these men advanced the Art, or Science if you will, of Preventive Medicine to heights seldom attained by today's wholistic health practitioners. The second section, comprised of a two-part Appendix, relates some of the main factors responsible for the rise and decline of the Arab Civilization during the Middle Ages.

In reading this book, the Preventive Medicine and wholistic health orientation of the physicians practicing during the Arab Civilization's golden era will be obviously apparent. Also, many of the recommendations and treatments these physicians made or gave to their patients will be seen to have been corroborated by the findings of modern science. In addition, several stories of remarkable, if not miraculous, cures, such as the one of Rhazes bringing back to life a dead man, will be presented. In short, after reading this book, one may easily come to the conclusion that not only were the Arab and Arabized physicians of the Arab Civilization's golden era 800 to 1,300 years ahead of their time, but that today's physicians are, in fact, 800 to 1,300 years behind the times! Let us now explore the profound wisdom which these ancient Master Healers have shared with us.

1. The Golden Era of Preventive Medicine – Early Years

"Surgery should never be undertaken until there is proof that the usual treatments are not effective."[1] These words have a modern ring to them. But, in reality, they belong to Abū al-Qāsim al-Zahrāwī, the famous physician of Muslim Spain, who spoke this wise counsel 950 years ago! Like most Arab doctors at the time, al-Zahrāwī was a practitioner of Preventive Medicine. A Holistic Health doctor, he used nutritional foods and herbs in the prevention and treatment of disease, resorting to surgery only if absolutely necessary. The sophistication of al-Zahrāwī's methods of treating and preventing disease, as well as those used by many of his Arab physician colleagues, was truly astounding—so much so that the years in which the Arab Civilization reigned supreme must be considered the Golden Era of Preventive Medicine. Let us explore this Golden Era and learn from it!

The Arab Civilization, the product of the Arab Empire or, as it's often referred to, the Islamic Empire, exercised tremendous worldwide influence for 600 years. Much of this influence was initiated after the Arabs completed their conquest of Persia, a scientifically-advanced society, in 652 CE; an additional boost in influence occurred after the Empire's capital, originally established in 632 CE in Medina in Arabia, was moved to the more cosmopolitan city of Damascus in Syria in 661 CE. This remarkable civilization directly affected the lives of millions of people from Spain to India. Islam, the religion founded by Mohammed, served to unify these diverse peoples. It also aided the cause of Preventive Medicine. The Koran, Islam's Holy Book, stresses the importance of personal cleanliness. It also "prohibits the drinking of wine and suggests that a vegetable diet is preferable to meat in hot climates."[2] The Prophet Mohammed himself followed impeccable hygienic and dietary practices.

Cyril Elgood, in his *A Medical History of Persia and the Eastern Caliphate*, relates the following interesting story regarding Mohammed and the dietary habits of the Arabs:

> One of the kings of Persia sent to Mohammed a learned physician. He remained one or two years in Arabia, but no one approached him or sought his treatment. At last he presented himself to the Prophet and complained: "I have been sent to treat your Companions; but during all this time no one has asked me to carry out my duties in any respect whatsoever." To which the Prophet replied: "It is the custom of these people not to eat until hunger overcomes them and then to cease eating while there still remains a desire for food." The physician answered: "This is the reason for their perfect health," kissed the ground in reverence, and departed.[3]

Elgood adds that the Arab physician, Haris bin Kalda, may have provided Mohammed whatever medical knowledge that he possessed. Haris left Arabia for a while and studied at the top medical hospital and research institute in southwestern Persia, Jundi-Shapur. Continues Elgood:

> While in Persia he met Shah Nushirvan. His reputed conversation with this monarch has been preserved. For the most part they discussed only questions of hygiene and methods for the preservation of health. Haris' main point was the Arab view that **excess of diet is the cause of all disease**. He also recommended the simplest possible manner of life. Diet should be at the plainest. Water is to be preferred to wine and salted and dried meats to fresh meat. The dietary should include fruit. The hot bath should be taken before meals. As for drugs, he bids the shah to leave them all aside as long as the health is good. Upon his return to Arabia Haris settled in Mecca and became the foremost physician of the Arabs of the desert… with the Prophet sending his sick friends to consult him.[4]

The example of the Prophet and the Koran's advice were not lost on the public. In general, inhabitants of lands under the sway of the Arab Civilization bathed at least once a day, and sometimes as much as five times daily (as recommended in the Koran). Most homes were spotless, and one always took off his shoes before entering. Before a Muslim ate, "rose-scented water was poured over his hands, and he wiped them on linen damask or terry cloth."[5] Space does not permit a full accounting of the refined manner in which these people lived. It can be said, though, that their advanced and pressure-free lifestyle has rarely been equaled in human history.

Donald Campbell, in his book *Arabian Medicine and Its Influence on the Middle Ages*, notes that while Arabic science made important contributions in many fields, "its fullest development is seen in the field of medicine."[6] Not surprisingly, it was therefore the Arab physicians who were most responsible for the Golden Era of Preventive Medicine. Campbell adds that these physicians' books and "Arabic medical works served the purpose of severing the science of medicine from theology and of creating a taste for Greek culture, and survived as a definite part of the medical system of Europe" for hundreds of years.[7]

The practices of the Arab physicians, far from being obsolete, can still be well put to use by today's doctors. But, before we explore their practices, it should be pointed out not all Arab physicians were of ethnic Arab origin; many were Persian, some were Jewish, and so on. However, these physicians resided within the area dominated by the Arab Civilization, and had in most cases become completely "Arabicized," meaning they usually spoke and wrote in Arabic. This is why they are usually referred to as "Arab physicians."

As mentioned earlier, the Arabs moved their capital to Damascus, which under the Umayyad Caliphate remained as such for 89 years (661 CE to 750 CE). Very little is known about the Arab physicians and their practices during this period, as no written works of theirs have survived. However, we do possess some intriguing information about a few of these doctors. Professor E. G. Browne, in his book, *Arabian Medicine*, informs us that only four physicians are known from the Umayyad Caliphate period. Three of them belonged to an undoubtedly distinguished family of physicians, the first two being Abu-'l-Hakam and his son Hakam, both of whom lived to be centenarians. Given their longevity, one has to think that whatever foods these men ate and lifestyle they followed could only benefit most other people. All we can say for sure is that they did not eat the heavily processed foods, adulterated with all manner of preservatives and pesticide residues, that fill the shelves of grocery stores nowadays. Browne reports one detail of Hakam's life, an instance where he successfully treated a life-threatening cut to a person's artery caused by a careless barber. Of much greater interest, though, is the fact that Hakam's son, 'Isa, may have authored the first Arabian wholistic health masterpiece, as he is said to have written a book on the Art of Medicine.[8] Unfortunately, no manuscript of this work is known to exist, and whatever manuscript may once have existed could have been destroyed when the Tartars decimated Baghdad in 1258 CE, destroying in the process the thousands of books contained in the city's famed library and research institute, "The House of Wisdom."

2. The Abbasid Caliphate

Unhappiness with the rule of the Umayyads led to their overthrow in 750 CE by Muslims known as the Abbasids, whose leader was a descendant of Abbas, one of the uncles of Mohammed. The Abbasid Caliphate initially made Kufa, a city in modern-day southern Iraq, its capital for twelve years. In 762 CE the Abbasid Caliph al-Ma'mun founded the city of Baghdad, located near the ancient city of Babylon, and established it as the new capital of the Arab Empire. It wasn't long before the Abbasid Golden Age, regarded to be from 775 CE to 861 CE, began. During this period some of the greatest Preventive Medicine doctors who ever lived resided and worked in Baghdad.

Hārūn al-Rashīd, the 5th Abbasid Caliph, in 787 CE (the second year of his reign) came down with an illness. He summoned Bukht Yishu, who at the time was Director of the Jundi-Shapur medical hospital, to his court to see if he possessed the expertise to be his personal physician. As Elgood relates, the Caliph obtained his answer in the following manner:

> Hārūn determined to test his skill, and calling for the urine of a mule presented it to Bukht Yishu for a diagnosis. Abu Quraysh [the physician to Hārūn's brother, al-Hādī, who had preceded Hārūn as Caliph] swore it was the urine of a favorite slave girl. Bukht Yishu calmly examined it and exclaimed that in that case the girl was bewitched, for only a mule could pass such urine. When asked what treatment he would give to such a one, he replied that a good feed of barley would be the most suitable. Hārūn was delighted, rewarded him with dress and money, and making him his chief personal physician bade all others stand below him. From that moment Bukht Yishu resigned his position at Jundi-Shapur and stayed in the service of the Caliph.[1]

A modern-day physician, if handed the same urine sample, would likely not even try to guess the origin of the urine, but instead would simply order it be sent off to a medical lab for a urinalysis. Once the results came back, the physician, seeing that some of the measurements for glucose, pH, ketones and other urine constituents fell outside the normal range for a human, would no doubt say that certain medications should be prescribed—not realizing that the lab results were those for the urine of a mule! Bukht Yishu, by contrast, just looked at the appearance of the urine and immediately knew what it was. It should come of no surprise to learn that for the next fourteen years until his death in 801 CE, Bukht Yishu was accorded full honors by the Caliph.

In 804 CE a pharmacist named Māsawayh moved to Baghdad. He had worked for 30 years in the dispensary at the Jundi-Shapur hospital in Persia. Māsawayh hoped to make his living now as a physician. In this he proved successful. He accomplished his goal by first curing a painful eye condition belonging to the servant of one of the Caliph's ministers. Māsawayh utilized some of the applications for eye conditions that he had prepared during his many years as a pharmacist to effect the cure. When the minister himself next came down with the same eye infection, Māsawayh treated the minister with the same medicine—once again, with success. As luck would have it, Caliph Hārūn al-Rashīd fell ill a while later with some eye disease. The minister told the Caliph about Māsawayh's having cured his eye infection, and so the Caliph requested Māsawayh's assistance. As one can guess, Māsawayh's treatment cured the Caliph's eye disease, which led to the Caliph appointing Māsawayh as his ophthalmologist. In this capacity as the court eye doctor, he also had the honor of being allowed, along with the Caliph's regular personal physician, Jibra'il (Bukht Yishu's son), to attend to a health problem of the Caliph's sister. When Jibra'il's prognosis

of this lady's condition proved wrong, but Māsawayh's proved correct, the Caliph promoted Māsawayh to also be his personal physician, bestowing on him the same honor and salary as that of Jibra'il.[2]

Māsawayh's success can best be accounted for by our realizing that the Arab or Arabized physicians primarily employed plant-based medicines in treating their patients' various health problems—a point we will make time and again in this book. We also must point out that many of the outstanding physicians whose lives and accomplishments we'll be examining were not true Arabs, but still properly could be classified as Arabized, meaning that they spoke in Arabic and wrote their medical books and treatises in Arabic, which had become the language of science as well as the predominant language used throughout the medieval era Islamic Civilization. Given that Māsawayh had worked much of the first part of his life at the Jundi-Shapur hospital, which, as we earlier mentioned, was located in southwestern Persia, it is not surprising that various sources indicate that Māsawayh most likely was himself a Persian or possibly an Assyrian East Syriac Christian, but was not a true Arab; therefore it is more accurate to describe him as being an Arabized physician, rather than as an Arab physician.

By the time Māsawayh had become the Caliph's personal physician, his 30+ years of active practice as a pharmacist had provided him the training and knowledge to be what we would call nowadays a Master Herbalist. As impressive as Māsawayh's career was, his greatest accomplishment can be said to have been his serving as a fantastic role model for his famous physician son, Yuhanna.

3. Yuhannā ibn Māsawayh

Court Physician to the Caliphs

Yuhannā ibn Māsawayh ("ibn" meaning "son of") was born in 777 CE. He originally pursued an ecclesiastical life, received minor orders and lived for a while in a monastery. But, he soon developed an interest in medicine, no doubt inspired by his father's success as a physician. Abandoning the monastery, he entered the medical profession, and became the court physician to the future Caliph, Hārūn al-Rashīd, better known by his regnal name, al-Ma'mun. Yuhannā began his service as court physician when al-Ma'mun was governor of Khorasan, a huge territory encompassing present-day northeastern Iran, southern Turkmenistan, and northern Afghanistan. This job ended when, as Elgood relates, "Yuhannā was recalled to Baghdad by Hārūn al-Rashīd who charged him with the duty of translating into Arabic the many Greek medical manuscripts which conquest and treaty had delivered into his hands. Yuhannā is even said to have gone to Greece for more material."[1]

For many years Yuhannā served as Director of the hospital at Baghdad, frequently delivering very well-attended lectures to the hospital's medical school students. His unrivalled expertise was such that he became, in addition, the personal physician for 50 years to the Caliphs. Elgood points out:

> In his capacity as a court physician Yuhannā served four caliphs—al-Ma'mun, al-Mu'tasim, al-Wathiq, and al-Mutawakkil. His reputation as a clinician exceeded that of all the physicians of Baghdad. A contemporary writer states that his consulting room was the most crowded of all in the city and that in his waiting room were to be seen all the leading doctors, theologians and philosophers. His fame as a teacher, too, exceeded that of all others in Baghdad. His pupils had the reputation of being the best instructed of all students in logic and in the writings of Galen.[2]

We see mentioned above "the writings of Galen." Galen was a Greek physician of the Roman Empire during the 2nd Century CE. He was considered by many to be the greatest medical researcher of antiquity, having published approximately 500 medical treatises during his life. Given Yuhannā's job during al-Ma'mun's reign of overseeing the translation of Greek medical works, many of which were undoubtedly works by Galen, it should come as no surprise to learn that Yuhannā himself wrote a large number of treatises and books dealing with all branches of medicine. While most of these works have disappeared from history, three still survive:

1) A tract on diet, titled *Kitāb Hawass al-agdiyah.* This was the first Arabic treatise concerning dietetics, written some time during the first half of the 9th Century CE. Basing this work on Galen's "Properties of Foods" book, Yuhannā describes the properties of 140 foodstuffs from the vegetable and animal kingdom, and then explains their good and bad effects on the body.

2) A brief work on medical curiosities, and

3) A treatise on the eye, titled *Daghal-ul-'Ayn* ("Alterations of the Eye"). This work is of particular interest and importance because it is the earliest surviving Arabic ophthalmological treatise. Given the skill and success of his father, Māsawayh, in curing eye afflictions, it makes sense that Yuhannā would author a treatise on this subject and perhaps even consulted his father while researching and writing this work.

We do know that one of Yuhannā's lost works was on barley water (*Ma'ash Sha' ir*) and its nutritional and medicinal value. It would have been quite interesting to see what Yuhannā had to say about this given the findings of present-day science regarding barley water. The WebMD website, for example, reports many potential health benefits from drinking barley water, such as: reduced risk for heart disease and diabetes, lowering cholesterol, aiding weight loss (due to the fiber content in unstrained barley water), and immune system support (produced by barley water's high level of antioxidants).

Another interesting fact about Yuhannā relates to his reported practice of dissection. Though there is no clear evidence that the Arab physicians openly practiced human dissection, Yuhannā appears to have been hundreds of years ahead of his time with respect to engaging in this practice on a human surrogate. Several biographers of Arab physicians, including Ibn Abī' Usaybi'a, the most famous such biographer, have related that "the celebrated Yuhannā ibn Māsawayh, being unable to obtain human subjects, dissected apes in a special dissecting room which he built on the banks of the Tigris, and that a particular species of ape, considered to resemble man most closely was, by command of the Caliph al-Mu'tasim, supplied to him about the year 836 CE by the ruler of Nubia."[3]

We remarked earlier that Yuhannā's medical lectures were well-attended, this being perhaps because of his abilities as a sharp conversationalist. Yuhannā, besides possessing a keen, quick mind, also possessed the unshakeable belief that a sound body, mind, and spirit are prerequisites for good health—a concept patients rarely hear their doctors emphasize to them nowadays. History records one incident where Yuhannā brilliantly drove home his wholistic philosophy:

A priest once came to him and said, "I feel unwell in my stomach." "Use," said Yuhannā, the *Electuarium Susianum*." "I have done so," replied the man. "Use the *Electuarium Diacyminum*," said Yuhannā. The main replied, "I have already taken some pounds of it." He then ordered him to take the

Pentadicon, to which the other replied, "I have already drunk a whole vessel full." "Use the *Confectio Ambrosia*," said Yuhannā. "I have already done so, and in large quantities." At last Yuhannā grew angry, and said to the man, "If you want to get well, embrace Islamism, for that is good for the stomach!"[4]

Contemporary research supports the importance Yuhannā attached to the mental and spiritual side of health. Scientists, for instance, have discovered that the body contains natural painkilling chemicals, called endorphins, which are released by the brain; and their studies indicate that the brain will release these chemicals into the body, thereby reducing pain, if the person simply *thinks* he will get better. This means that the positive, comforting frame of mind that meditation, prayer, hypnosis, and visualization are meant to provide contain definite physical benefits.

Yuhannā, who as you might have gathered by now did not suffer fools gladly, was not shy in letting others know his opinion of them. He once remarked to a courtier who had annoyed him, "If the ignorance wherewith thou art afflicted were converted into understanding and then divided amongst a hundred beetles, each one of them would be more sagacious than Aristotle!"[5]

Even Caliph al-Wathiq was not spared Yuhannā's sharp tongue. One day the caliph took Yuhannā with him to go fishing. Elgood relates the story:

> The caliph could not hook a fish and at last bade Yuhannā depart as he thought he was bringing him bad luck. "How can I be unlucky?" said Yuhannā. "I am the son of a purchased slave girl; yet I am the friend of caliphs. I will tell you who is really the demented one. That is the man who, though a prince and the son of a prince, yet leaves his palace for a hut by the river and indulges in a sport which is only fit for the lowest of men."[6]

In 857 CE Yuhannā, at the age of 80, died at Samarra, a city located about 80 miles north of Baghdad. True to himself to the very end, on his death bed he told the attending clergy to not bother praying for him, telling them this: "A few pills will do more good than all your prayers, though they go on until the Day of the Resurrection."[7] Although Yuhannā's extremely productive physical life ended at this point, his positive influence on the development of Preventive Medicine remained, as we shall soon see.

4. Hunayn ibn Ishāq

"Sheik of the Translators"

Yuhannā had two pupils who ended up greatly advancing the field of Preventive Medicine, one of whom was Hunayn ibn Ishāq, known during the Middle Ages in the Latin West as Johannitius. Born in 804 CE in Hira (a city in south-central present-day Iraq), Hunayn served as a dispenser of medicines for Yuhannā at the hospital in Baghdad. In this capacity and in conjunction with his great love of learning, he attended and intently followed the lectures Yuhannā gave to the hospital's medical school students. One day Hunayn's routine of attending Yuhannā's lectures came to an abrupt end. Browne relates what happened:

> But he [Hunayn] was prone to ask too many troublesome questions, and one day his master, losing patience, exclaimed, "What have the people of Hira to do with medicine? Go and change money in the streets!" and drove him forth in tears. But Hunayn, more resolved than ever on pursuing knowledge to its source, went away for several years to learn Greek. During this period one of his former acquaintances, Yusuf the physician, one day saw a man with long hair and unclipped beard and moustache reciting Homer in the street, and, in spite of his changed appearance, recognized his voice as that of Hunayn. He, being questioned, admitted his identity, but enjoined silence on Yusuf, saying that he had sworn not to continue his medical studies until he had perfected himself in having knowledge of the Greek language. When he finally returned, Jibra'il, to whom he attached himself, was delighted with his Greek scholarship and declared him to be a miracle of learning.[1]

Word of Hunayn's expertise in both Greek and the medical practices of the ancient Greek physicians reached Yuhannā, and soon the two were reconciled. Hunayn proceeded to work for years at Baghdad's "House of Wisdom," leading a school of Arabic translators. It is reported that

95 works of Galen were translated into Syriac by Hunayn; another 36 books by Galen Hunayn translated into Arabic, though 16 of these were accomplished with the assistance of his nephew and top pupil, Hubaysh. Six more books by Galen were translated into Syriac and 70 more into Arabic by his pupils. However, it was Hunayn's translations of the Greek medical works which were regarded as the best and most correct.[2] Included among the many Greek medical works that Hunayn translated into Arabic was the *Aphorisms* of Hippocrates, this being accomplished with the assistance of another pupil of his, 'Isa ibn Yahyā.

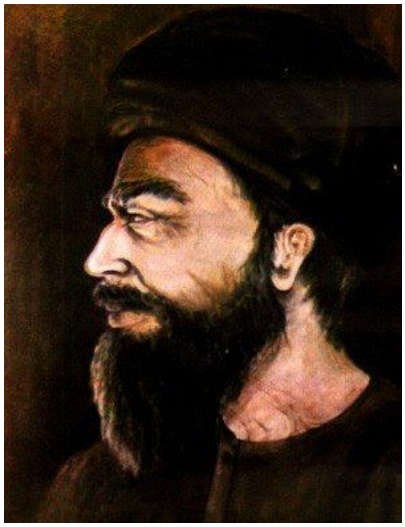
Although called the "Sheik of the Translators," Hunayn was not just a translator. He himself wrote books on several subjects, ranging from religion to medicine. *On Stomach Ailments* was one such book he wrote. Scholars, though, regard Hunayn's *Isagoge* (*Liber introductionis in medicinam*) to have been his most influential book. Campbell, in his brief description of *Isagoge*, states that "this is of the nature of an original work; it gives a systematic review of the Galenic system of medicine and, owing to its popularity as an introductory medical work in the later Middle Ages in Latin Europe, it also contains medieval medical theories."[3]

Arguably, Hunayn's most popular and influential medical book was, in fact, his *Questions on Medicine for Students.* This work became a definitive text in Arabic medicine and was printed and published widely in Europe. This book, unlike other books on Arabic medicine that are written in a conventional manner, assumes a question-and-answer style. Because of its effectiveness the question-and-answer method is firmly established nowadays as a popular teaching technique in medical schools, and is especially favored by clinicians in training and educating their students in a hospital setting. In short, it is largely thanks to Hunayn, the leading developer of the question-and-answer method in Islamic medical education, that this is now the case.

Hunayn's reputation as an outstanding scholar and translator of medical works, along with his close relationship with Caliph al-Mutawakkil, led the caliph to appoint him as his personal physician. After a while, though, the caliph became distrustful of Hunayn, despite their good relationship, with the reason for this being that the caliph entertained fears of being poisoned. Accordingly, to allay his fears, the caliph subjected Hunayn to a hard test. Browne relates that the caliph "bade Hunayn to concoct a poison for one of his enemies, offering him rich rewards if he would do so, but severe punishment—imprisonment or death—if he refused. He refused and was imprisoned for a year, when he was again brought before the Caliph and bidden to choose again between compliance and a rich reward, and the sword of the executioner. 'I have already told the Commander of the Faithful,' replied Hunayn, 'that I have skill only in what is beneficial, and studied naught else'; and being again threatened with instant death he added: 'I have a Lord who will give me my right tomorrow in the Supreme Uprising, so if the Caliph would injure his own soul, let him do so.' Then the Caliph smiled and declared that he had only desired to assure himself of Hunayn's probity before yielding him implicit confidence."[4]

This story well illustrates the high ethical standards upheld by the Arab physicians of the Abbasid Caliphate's Golden Age. And, it makes one want to ask and learn the answer to this question: how many of today's doctors, especially those in the habit of ordering unnecessary tests for their patients in order to bill their patients or their patients' health insurance plans more money, would jeopardize their life and career by refusing to carry out a command similar to the one Hunayn received from the Caliph?

5. Alī ibn Sahl (Rabban) al-Tabarī and *The Paradise of Wisdom*



The second person who studied under Yuhannā and made a significant contribution to the development and practice of Preventive Medicine was Alī ibn Sahl (Rabban) al-Tabarī. Though his year of birth and death are not clearly known, al-Tabarī was likely born around 779 CE into an intellectual Christian Syriac family at Merv, a city located not far from present-day Tehran. He was taught by his father, Saul, several subjects, becoming in the process fluent in Arabic, Persian and Syriac, and proficient in Greek and Hebrew. It turns out that Saul, who, being both a successful scholar and medical man, possessed the honorific title *Rabban*—the Syriac word for "Our Master" or "Our Teacher"—a title which many years later also became part of al-Tabarī's name. Saul well deserved this title, given that among his many accomplishments he produced the first translation into Arabic of Ptolemy's famous astronomical treatise, the *Almagest*. As described by al-Tabarī, Saul was a man "who had a great zeal for the pursuit of virtue and sought to derive benefit from books on Medicine and Philosophy. Herein his object was not so much to seek after praise and profit as to conform himself to the Divine Attributes, and so to earn the consideration of mankind."[1] Al-Tabarī, as one can guess, also received instruction in medicine from his *Rabban* father and, as we'll soon see, it was not lost on him.

Perhaps the most positive turning point in al-Tabarī's life occurred while he was still a youth. Salim Ayduz, in his 2012 *Muslim Heritage* paper, "'Alī b. Saul Rabban al-Tabarī: Author of Firdaws al-hikma (Paradise of Wisdom)," describes this development as follows:

When he was ten years old, he was taken to Tabaristan [Persian province located just south of the Caspian Sea] by his father and spent his early youth in Tabaristan. The intellectual and pleasant atmosphere enabled him to devote his time to the study of a range of subjects including philosophy, medicine and religious, as well as various aspects of natural sciences. After he had completed his education in Tabaristan, he moved to Iraq in 813 CE. Because he had lived in Tabaristan, he became known as al-Tabarī. When Māzyār b. Qarin was appointed as governor in Tabaristan in 825 CE, he returned to Tabaristan and entered

Māzyār's service as a scribe. During this time, he started to compose his Firdaws al-hikma [*Paradise of Wisdom*] which he finished in Samarra in 850 CE.[2]

As the scribe/secretary for Māzyār, the Persian governor of Tabaristan, al-Tabarī was able to work for many years unhindered on his *Paradise of Wisdom* book project. However, his high-level job ended when beginning in 840 CE, the Saffārids [Persian people who occupied much of present-day central/eastern Iran, Afghanistan, and western Pakistan] started recapturing major territories in Persia from the Abbasid Caliphate. Al-Tabarī, in what he recalled as "a bitter event" that "led me to leave my motherland," was compelled to move, eventually resettling in Baghdad where he subsequently became secretary for three Caliphs—al-Mu'tasim (reigned 833-842 CE), al-Wathiq (r. 842-847 CE), and al-Mutawakkil (r. 847-861 CE).[3]

During his long career, al-Tabarī wrote 14 books, primarily on hygiene and medicine. While many of these works no longer exist, the few which still are extant include:

Hifz al-sihhah ("On the Preservation of Health")
Kitāb al-Lu'lu'a — a treatise on medicine
Kitāb fi tartib al-Agdhiya ("Treatise on the Preparation of Food")

One of his books which would likely prove interesting to read, but unfortunately no longer survives, is:

Kitāb Manafi' al-at'ima wa al-ashriba wa al-'aqakir — a work on the proper use of food, drink and medicine

Most importantly of all, al-Tabarī's masterpiece book, the *Paradise of Wisdom* ("Firdaws al-hikma"), has come down to us. Dedicated understandably to his boss, Caliph al-Mutawakkil, the *Paradise of Wisdom* is about 620 pages long, and is divided into 7 books called *naw'*, 30 subsections called *maqalas* and 365 parts called *bāb*. Now, the importance of the *Paradise of Wisdom* cannot be understated. **It is the first encyclopedia on medicine ever written** and, in addition, happens to be the oldest technical medical book written by a Persian physician in Arabic. Its general arrangement is along the lines of the compendiums authored by the Greek medical writers, Paul of Aegina and Orabasius of Pergamon. Among other things, this work presents 120 quotations from Hippocrates, 20 from Galen, 13 from Dioscorides, and many more from other ancient Greek medical authors. Only three Arab or Arabized physicians are quoted by al-Tabarī: Yuhannā, whose lectures al-Tabarī attended, Māsawayh and Hunayn. Now, what al-Tabarī created was a template, so to speak—that is to say, a format which future authors of medical encyclopedias could pattern their work after. And, in fact, this is exactly what occurred. Ayduz relates the *Paradise of Wisdom's* path-breaking accomplishment:

> As a medical encyclopedia, it quickly became a model for later physicians including al-Majusi (Haly Abbas), followed by original contributions from Rhazes, Avicenna and al-Biruni that influenced Eastern and Western medical circles for several centuries. From the writings of Rhazes, it is obvious that he benefited from the works of al-Tabarī and quoted them.[4]

We are, indeed, most fortunate that al-Tabarī lived as long as he did, given that he did not complete *Paradise of Wisdom* until he was in his 70s, this occurring, as mentioned earlier, in 850 CE, the third year of al-Mutawakkil's reign. He worked on the encyclopedia for around 25 years, and one might criticize him for taking so long and also for not producing as good a medical encyclopedia as ones that were produced by future Arab physicians. But, this latter criticism would

be like criticizing the Wright brothers for flying in 1903 a plane (their "Wright Flyer") that was not as good as future planes that came into being, for what the Wright brothers flew was the *first and only* plane that at the time could fly! Their accomplishment, in short, is what led to the development in following years of very capable airplanes. As for the criticism that it should not have taken al-Tabarī 25 years to write *Paradise of Wisdom,* a few key points need to be kept in mind. First, al-Tabarī could not write a high-quality, comprehensive encyclopedia until he had thoroughly researched it, and such research takes lots of time. Ayduz provides us an idea of the tremendous amount of research that was involved in order for al-Tabarī to compose the world's first-ever medical encyclopedia:

> Al-Tabarī started this book almost two decades earlier after reading the available medical texts on each subject. This is the work on which his fame rests. It is the first-ever medical encyclopedia, which incorporates all the then available branches of medical science. The virtue of al-Tabarī's book was the abstraction of essential information from the Syriac medical texts, as well as from Greek and Indian compendiums, and compiling all the information and abstracts into a manageable, concise volume, which embraced the whole field of medical knowledge. It is particularly known for its extensive treatment of anatomy. His work contains a special section devoted to Indian medicine (he refers to Indian physicians such as Susruta, Charaka, Nidana and Ashtangahadaya). He relied on the Hippocratic corpus and the writings of Hippocrates, Galen, Dioscorides, Pythagoras, Democritus, Aristotle, Theophrastus and Ptolemy.[5]

Because al-Tabarī was fluent in Syriac and proficient in Greek, he was able to understand what the medical texts written in those languages said. But, how he came to understand what the Indian medical texts contained is not known, although one has to think that some of those texts had already been translated into Arabic, perhaps by one or more of the translators working with Hunayn in the "House of Wisdom." Besides all the time-consuming work al-Tabarī was compelled to do each day for 15 years as Māzyār's scribe/secretary and then for the next 10 years as the secretary for three different caliphs, the second point one needs to keep in mind regarding why it took al-Tabari 25 years to complete *Paradise of Wisdom* is that he did not write just one encyclopedia. He wrote two! For al-Tabarī, either while or after creating the Arabic version of his encyclopedia—titled, as we've mentioned, *Firdaws al-hikma*—also translated it into Syriac, coming out with the Syriac version titled *dabid-murra*.

The following helpful summary of the contents of the *Paradise of Wisdom* has been provided to us by Ayduz:

***Naw' one*:** This volume discusses contemporary knowledge of medical science. In that era, these principles formed the basis of medical science. It is the introduction to the encyclopedia and contains some philosophical descriptions as well.

***Naw' two*:** Elucidation of the organs of the human body, rules for keeping good health and comprehensive account of certain muscular diseases. Contains five *maqalas* and information about the care of the health (preservation of health).

***Naw' three*:** Contains one *maqala* — Discussion and description of diet for good health and prevention of disease.

***Naw' four*:** Discussion of all human diseases. In addition to information derived from ancient medicine, in this chapter he also added his own observations and interpretations. It is the longest and most significant volume, nearly half the size of the whole book, and comprises twelve sections (*maqalas*):

a) General causes relating to eruption of diseases
b) Diseases of the head and the brain
c) Diseases relating to the eye, nose, ear, mouth and the teeth
d) Muscular diseases (paralysis and spasm)

e) Diseases of the regions of the chest, throat and lungs
f) Diseases of the abdomen
g) Diseases of the liver
h) Diseases of the gallbladder and spleen
i) Intestinal diseases
j) Different kinds of fever
k) Miscellaneous diseases — Brief explanation of organs of the body
l) Examination of pulse and urine

***Naw' five*:** Description of flavor, taste and color, and also relations between foods and the body.
***Naw' six*:** Descriptions on herbal medicine, drugs and poisons. Comprises six *maqalas*.
***Naw' seven*:** Deals with miscellaneous topics. Discusses climate and astronomy. Also contains a brief mention of Indian medicine. Contains six *maqalas*.[6]

As one would expect in examining the contents of an encyclopedia, the summarization by Ayduz of part of *Naw' two*, i.e., its containing "information about the care of the health (preservation of health)", could be expanded upon. Max Meyerhof, in his classic July, 1931 *Isis* paper, "'Alī at-Tabarī's *Paradise of Wisdom*, one of the oldest Arabic Compendiums of Medicine," provides such an expansion, informing us that seven of the subsections of *Naw' two* cover these topics: On Hygiene; On the Diet of Each Temperament at every Age; On the Diet in Spring, Summer, Autumn, and Winter; On Diet useful and harmful to the different organs.[7]

Seyyed Nasr, in his book *Science and Civilization in Islam*, states that the *Paradise of Wisdom* "is of particular value in the fields of pathology, pharmacology, and diet."[8] To better appreciate this assertion by Nasr, let us explore this work in a little more detail.

In reading the *Paradise of Wisdom*, it should become apparent to the reader that al-Tabarī possessed a remarkable ability to correctly diagnose diseases and various health problems in his patients. He relied solely upon his knowledge about what certain symptoms manifested in the patient meant, for he could not, of course, take X-rays, MRIs and the like or have his patient's blood analyzed by some bio-medical lab. Let us explore this matter of al-Tabarī being an expert diagnostician.

Mohammadreza Ardalan *et al* initially inform us in their 2015 *Journal of Medical Ethics and History of Medicine paper*, "A Review of Ferdous al-Hekma fil-Tibb by Alī ibn Rabban al-Tabarī," that the *Paradise of Wisdom's* "first five chapters are dedicated to temperaments, humors, and the general aspects of health. Then the diseases of different organs and their treatments are discussed in detail."[9] With respect to the respiratory organs, for example, al-Tabarī states the following in regard to **dyspnea** and **asthma**:

Respiratory organs include the lung, larynx and a partition that exists between the chest and the abdomen, which is called the diaphragm… and in pleuritis the pain radiates to the neck or the brain and disturbs consciousness.

Ardalan *et al* remark: "In the paragraph above, the anatomical considerations about the radiating pattern of pain are interesting as these symptoms are used in contemporary medicine as well."[10]

We see al-Tabarī explaining **pain in the large intestine** in the following manner:

If someone has large intestinal problems… he feels the pain in his kidney. Large intestine pain happens in the lateral part of the abdomen and is expandable… but kidney pain is constant and remains confirmed to one area, does not spread and is [often] located above the waist… And if the patient lies in the prone position, he feels heaviness in the kidney area… In patients who complain from flatulence and intestinal air entrapment, if you palpate the affected area, you can feel a lump… If air entrapment is the cause of pain, it radiates from one part to the other part."

Ardalan *et al* comment: "This passage contains some very interesting information. Flatulence and air entrapment within the intestinal loop are sometimes mistakenly diagnosed as kidney pain, a fact that has been pointed out in modern physical examination books."[11]

Needless to say, Ardalan *et al* point out several other diseases and ill-health conditions that al-Tabarī correctly diagnosed without, to repeat, the use of modern-day imaging technology or blood and urine analyzing machines—notably liver disease, stomach disease/ulcers, paralysis, diarrhea, and hemorrhage in the upper and lower organs. So impressed were Ardalan *et al* with al-Tabarī's diagnostic expertise that they concluded their paper as follows: "Some of the physical signs discussed by al-Tabarī in the *Paradise of Wisdom* are described so vividly that they are understandable by contemporary medical students. In conclusion, the *Paradise of Wisdom* by al-Tabarī shows the strength and depth of medical knowledge in the early Islamic period."[12]

With respect to the type of treatments that al-Tabarī recommended, we'll look at the following example. **Treatment of Heart Diseases** (weakness, throbbing, swoon, etc.) is the topic al-Tabarī covers in Chapter 129 of *Paradise of Wisdom*. For these diseases he recommends that patients take among other things the herb faranj-mushk, which is a kind of **basil** common to Persia. It turns out, as we are informed by the *WebMD* website contributors in a 2022 article, "Health Benefits of Basil," that basil contains an ingredient called *eugenol* which can block calcium channels in both vascular smooth muscle cells and cardiac muscle cells and therefore may help lower one's blood pressure; in addition, they point out that basil also contains magnesium, which is known to relax muscles and blood vessels, leading to improved blood flow.[13] The importance of magnesium for people with or at risk for heart disease cannot be understated. The U.S. National Institutes of Health (NIH), for example, states the following on its website's "Magnesium Fact Sheet for health Professionals": "A systematic review and meta-analysis of prospective studies found that higher levels of magnesium were significantly associated with a lower risk of cardiovascular disease, and higher-dietary magnesium intakes (up to approximately 250 mg/day) were associated with a significantly lower risk of ischemic heart disease caused by a reduced blood supply to the heart muscle."[14] Al-Tabarī, of course, would not have known that basil contains eugenol or magnesium; he just knew that basil worked great for his heart disease patients.

The greatness of al-Tabarī perhaps best reveals itself in the high ethical and professional standards he advocated and personally followed. Ayduz tells us that we find, for example, in *Paradise of Wisdom* al-Tabarī insisting "that the conduct of practitioners should be as high as their calling. Those aspiring to be practicing health professionals, he contended, should acquire four virtues essential in their everyday activity: gentleness, contentment, pity, and uprightness. In serving his patient, the physician's primary objective should be helping the sick rather than seeking monetary gain."[15] In a section in *naw' seven* entitled "The Refutation of the Opinion of those who underrate medicine," al-Tabarī showed that he had no patience whatsoever for anyone who disparaged the field of medicine by first stating, "Some writers of our time have been led by self-conceit and ignorance of their personal worth to deprecate Medicine, pretending that there is in the

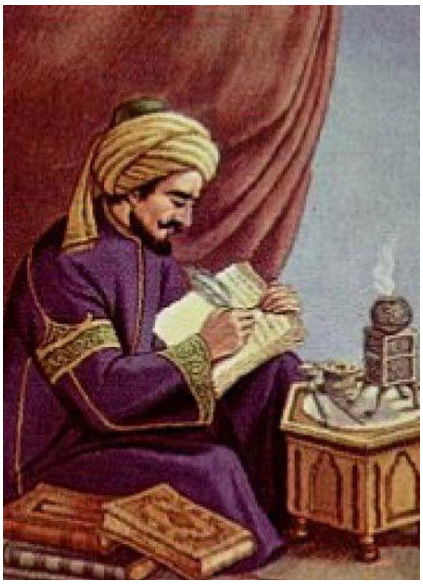
things neither utility nor noxiousness to the bodies and to mankind. Those who speak this do not deserve an answer or a requital, as they are like bats and owls to whom the light of the sun is blindfolding and not salutary."[16] He next backed up his criticism of the disparagers of Medicine by citing a multitude of efficacious remedies and mentioning that even animals know the health-promoting action of certain plants.

Now, after completing the *Paradise of Wisdom*, we are informed by Ayduz that al-Tabarī wrote few other books and that "it can be deduced that he passed away after 864 CE in either Baghdad or Samarra."[17] If the 864 CE or beyond estimated date of death is correct, then al-Tabarī would have been in his mid to late-80s when he died. Historians have not reported the cause of his death.

As we recall, Nasr highlighted what he considered to be *The Paradise of Wisdom's* most important contributions to health and medicine, stating that al-Tabarī's encyclopedia "is of particular value in the fields of pathology, pharmacology, and diet." But, if today's medical school students and practicing physicians would only read this book's short 4-page-long Introduction, they might learn something much more important: what they need to do in order to be a model physician. For example, as Ardalan *et al* relate, **al-Tabarī advises that no one should practice medicine "unless he is adorned with generosity, kindness and devotion, and is not driven by greed. A physician should be compassionate toward his patients."**[18] Further, **"a physician** should prescribe medicine after physical examinations and **should never be arrogant and take excessive pride in his skills."**[19] Regarding any of those colleagues who are less than perfect, al-Tabarī recommends that a doctor "should alert his colleagues to their flaws, and in doing so he will gain a high standing among them."[20] In concluding his advice to physicians that they would be wise to embrace high ethical standards in their medical practice, he reminds them of Hippocrates' profound insight: **"Life is short and knowledge long, opportunities are fleeting, time is passing, experiences are perilous and destiny is strict."**[21]

6. Al-Kindī

Arab Polymath Genius



We shall now examine the life and contributions to mankind of one of the most remarkable men who ever lived—Ya'qūb ibn Ishāq al-Kindī, known in Latin Europe during the Middle Ages as Alkindus. Born in Kufa in 801 CE, al-Kindī received his early-years education in that city. His father happened to be the governor of Kufa, which probably facilitated al-Kindī's attaining the excellent educational and job opportunities he enjoyed later on. Martin Levey, the translator of Al-Kindī's medical formulary into English, informs us that as a "young man al-Kindī studied at Basra and Baghdad, where many of the great Muslim scientists and philosophers had gathered under the aegis of the forward-looking Caliph al-Ma'mun. Later, al-Kindī became the tutor of the succeeding Caliph's son. It was at this court, under the Caliph's protection, that al-Kindī was introduced to the writings of such ancient masters as Hippocrates, Plato, Aristotle, Euclid, Hypsicles, Ptolemy, and many others, which he subsequently spent much time in interpreting to the Muslims in a number of his philosophical works."[1]

Campbell adds to the above description of al-Kindī that he also "became physician to the court of the Caliphs al-Ma'mun and al-Mu'tasim at Baghdad, where he enjoyed a very high reputation as a physician, philosopher, astronomer, and mathematician."[2] He worked most of the time in Baghdad's "House of Wisdom," the library and research institution established by al-Ma'mun, as a calligrapher and also held the important position of overseeing the translation of Greek and Hellenistic philosophy texts into Arabic. Colleagues of his included al-Khwārizmī (regarded as the Father of Algebra) and the Banū Mūsā brothers (inventors of mechanical devices that were far in advance of anything invented previously).

Considered by many, such as the Renaissance scholar Geralomo Cardona (1501-1575 CE), to be one of the twelve greatest minds of the Middle Ages, al-Kindī's versatility and productivity

as a polymath has rarely been matched in human history. This is well-indicated by the following passage we observe in Levey's *The Medical Formulary or Aqrābādhīn of Al-Kindī*:

In the *Fihrist* written by al-Nadīm, we find al-Kindī's works listed. They comprised: 25 philosophical *opera*, including works on Aristotle and Porphyry; 9 works on logic; 11 treatises on mathematics; 8 works on the sphere; 8 on music; 24 on astronomy; 27 on geometry; 21 on the celestial orbit; 24 on medicine; 9 on astrology; 17 on polemics; 14 on the atmosphere and meteorology; 10 on determination of distances; 5 on preconception; and finally, 36 works on technology and chemistry.[3]

With respect to these over 245 works by al-Kindī, we are informed more specifically the following about them:

In the field of mathematics, al-Kindī played an important role in introducing Indian numerals to the Islamic and Christian world. He was a pioneer in cryptoanalysis and developed several new methods of breaking ciphers, including the frequency analysis method. Using his mathematical and medical expertise, he was able to develop a scale that would allow doctors to quantify the potency of their medication. The earliest known work concerned with environmentalism and pollution was an Arabic medical treatise written by al-Kindī. His writings on this subject covered air, water and soil contamination, waste mishandling, and environmental assessments of certain localities.

There are more than 30 treatises attributed to al-Kindī in the field of medicine, in which he was partly influenced by the ideas of Galen and partly by his own personal experience and other Muslim physicians in his time. Al-Kindī's most important work in this field is *De Gradibus*, in which he demonstrates the application of mathematics and quantification in medicine, particularly in the field of pharmacology. For example, he developed a mathematical scale to quantify the strength of a drug and a system, based on the phases of the moon, that would allow a doctor to determine in advance the most critical day of a patient's illness.

In his *Treatise on Diseases Caused by Phlegm*, al-Kindī provided the first scientific explanation and treatment for epilepsy. He states: "When the phlegm melts and changes to a bad irritant quality, it goes forth and ascends to the brain from a certain direction, then it sinks down through the principal veins towards the heart, and by its irritant quality it deranges the place of sense, thought and recollection in the brain. It passes through the veins towards the heart, and if the natural heat whose source is the heart is strong enough to dissolve it, it does so, and what happens, as a consequence, is epilepsy (*sar*). For the parts of the brain which we have mentioned, becoming injured, are overcome and cease to function. The disturbance which we see in the patient's body is owing to the conflict of the natural heat with the affection. When it prevails over it, it attacks and dissolves it. This is the meaning of the foam which is seen at the patient's mouth. When this occurs, his recovery is near."[4]

Now, let us turn to an examination of al-Kindī's *Medical Formulary*. The only known manuscript of this remarkable book came to light in the early-1960s, and al-Kindī presents in it 226 pharmaceutical preparations, most of which are derived from botanical sources. All of these preparations are ones he actually used in treating his patients, and Levey informs us that "many of them were well known to the Babylonians."[5] Going into greater detail regarding the *materia medica* or origin of the components of the medicines al-Kindī gave his patients, Levey provides this interesting breakdown:

With respect to the names of the materia medica mentioned by al-Kindī in his *Medical Formulary*, 33% came from ancient Mesopotamia, 23% came from Greek sources, 18% came from Persian, 13% from Indian, 5% from Arabic, and 3% from Egyptian sources, with the remainder of unknown origin.[6]

The following representative sample of the 226 pharmacological preparations detailed in *The Medical Formulary* are presented in al-Kindī's words:

1) For **pain of decayed teeth** affected by the cold.

Myrrh is pulverized and sprinkled on their bases both inside and outside. It has been proved that it relieves pain speedily.[7]

Contemporary herbalists would no doubt endorse al-Kindī's treatment for decayed teeth. For example, John Lust, author of *The Herb Book*, informs us that myrrh makes a good gargle and "mouthwash for sores in the mouth and throat, sore teeth and gums. Its disinfectant properties make myrrh suitable as a wash for wounds. Add myrrh powder to the sore or wound after washing for continued disinfectant activity."[8]

2) Preparation for a drug to **strengthen the eyesight** when it is weak from poring over books and examining them.

Extract of macerated **pomegranate**, which has been thickened, heated over a fire. 1 part
Extract of **fennel**, which has been dissolved by heat also. 1 part

The two are mixed and put in the sun. When they are mixed, the viscosity is increased. The two make a good collyrium [i.e., eyewash or eye salve]. It helps the eyesight by improving it, with God's help.[9]

With respect to fennel, Lust, in agreement with al-Kindī, recommends that one "use a decoction of the seeds as an eyewash for irritation and eyestrain."[10] Lust also points out that pomegranate is "an excellent astringent for external use," which would account for its effectiveness as one of the components in al-Kindī's eyewash, given that an astringent is an agent that contracts tissue, reducing secretions and discharges.

3) Description of a clyster [i.e., an enema]. Abu Muhammad recalled that he found it useful and healing for warming the **kidneys** and for **hemorrhoids**.

A bowl of *walnut oil* is taken and a bowl of Persian **leek juice**. It is useful, with God's help.[11]

Lust relates that "leek has about the same properties as garlic, but to a lesser degree," and that it "makes a good, non-irritating diuretic." He adds that walnut "is particularly suitable for chronic constipation."[12] Given these qualities possessed by leek and walnut, it makes sense that combining the two would provide the above-described healing benefits.

4) Electuary [i.e., a medicine mixed with honey or syrup] for a **cough caused by catarrh**.

Flax seed	1 part
Sweet raisins freed from seeds	1 part
Pine seed	1 part
Root of licorice	1 part

All are mixed after pounding and sieving. It is mixed with honey bereft of froth. It is taken in the morning and at bedtime. It helps, God willing.[13]

Probably the key ingredient in this cough syrup recommended by al-Kindī is licorice. Dr. John Christopher, considered by many to be the greatest Master Herbalist of the 20th Century, states in *School of Natural Healing*, his reference volume on natural herbs, this about licorice: "It is cleansing and heals any inflamed mucous membranes and catarrhal conditions. The powdered extract or root is excellent as an excipient (substance used to give preparations a suitable form or consistency)."[14] Used alone as a syrup, Christopher recommends the person battling a cough take 1 teaspoonful to 1 tablespoonful or more as required. He adds that licorice is generally not used alone, and, in fact, al-Kindī's syrup contains other ingredients besides licorice, notably flax seed.

Regarding flax seed, Christopher lists bronchitis, pneumonia, inflamed respiratory mucous membranes, and catarrh as some of the ailments that this seed addresses.[15] Just from what Christopher has told us about licorice and flax seed, many would say that we have enough facts to understand why al-Kindī asserted that his syrup for cough caused by catarrh helps. But, others would want to know what scientific studies reveal about the impact that licorice and flax seed have on coughs before acknowledging that al-Kindī and Christopher knew what they were talking about. So, let us try to satisfy such people.

In the December, 2018 issue of the peer-reviewed scientific journal *Phytotherapy Research,* we see a paper, "Liquorice (*Glycyrrhiza glabra*): A Phytochemical and Pharmacological Review," authored by Giulia Pastorino and three co-researchers. The authors of this paper confirm the wisdom of al-Kindī and Christopher in recommending licorice for coughs caused by catarrh, stating as follows:

> The antitussic [i.e., cough-suppressive] and expectorant effects of licorice have been reported by different authors, particularly its useful effects on the treatment of sore throat, cough, and bronchial catarrh (Damle, 2014; Fiore *et al.*, 2005). These effects are associated with the presence of glycyrrhizin [i.e., the sweet-tasting constituent of licorice root] that helps to expel congestion in the upper respiratory tract and accelerates tracheal mucous secretion (V. Sharma *et al*., 2016). Likewise, liquiritin apioside, an active compound reported in the methanolic extract of licorice, has the ability to inhibit capsaicin, a compound that induces cough (Kamei, Nakamura, Ichiki, & Kubo, 2013).[16]

In regard to flax seed, a paper by Rajju Soni and three co-authors, titled "Flaxseed—Composition and Its Health Benefits," was published in the March, 2016 issue of the peer-reviewed scientific journal *Research in Environment and Life Sciences*. In this paper Soni and his co-researchers mention that scientists had examined the impact polyunsaturated fatty acids (PUFAs) consumption has on pregnancy and early childhood, and also these acids' "influence on allergy and respiratory diseases, as the long-chain polyunsaturated fatty acids have been reported to have immune modulatory effects. Decreased consumption of omega-6-PUFAs in favor of more anti-inflammatory omega-3-PUFAs (flax is rich in alpha-linolenic acid, which is a biological precursor to omega-3 fatty acid) in modern diets, has demonstrated their potential protective role in allergic and respiratory diseases."[17] Given what Soni *et al* report, al-Kindī's inclusion of flax seed in his electuary for cough caused by catarrh makes sense.

Al-Kindī's contributions to mankind can be described as being not only profound, but also unique. Campbell points out that "Al-Kindī was the only Arabic writer of pure Arab stock who contributed to Arabian Medicine and Science" and adds "all that the genuine Arabs contributed to intellectual advancement was their name and language, and a patronage of learning generally."[18]

If one could only use one word to characterize this genius polymath's life, it would be this: **Truth**. History records al-Kindī telling us the following: "We ought not to be embarrassed of appreciating the truth and of obtaining it wherever it comes from, even if it comes from races distant and nations different from us. Nothing should be dearer to the seeker of truth than the truth itself, and there is no deterioration of the truth, nor belittling either of one who speaks it or conveys it." And lastly this wise advice: **"One must never be afraid of new ideas, no matter the source. And we must never fear the truth, even when it pains us."**[19]

7. Rhazes

"The Experienced"

We now shall investigate the phenomenal life and accomplishments of a man who has received universal praise from medical science historians—Rhazes, whose formal name was Muhammad ibn Zakariyyā al-Rāzī. His date of birth has been in dispute, with some, such as Campbell, saying that he was born in 841 CE, while others such as Dr. Ragheb El-Sergany, in his October 4, 2009 *Quran & Science* article, titled "Rhazes, a Miracle in Medicine Across Generations," place it around 864 CE. The former birth year—841 CE—makes it possible for Rhazes to have been a pupil of al-Tabarī, which Browne and others assert he was. If so, al-Tabarī likely impressed upon his star student the view that "an ignorant Physician hastens death,"[1] for Rhazes responded to his instructor's call for developing a mastery of medicine by becoming, according to Nasr, "without a doubt, the greatest clinical and observational physician in Islam, and along with Avicenna, the most influential, both East and West."[2] Browne, evidencing the universal admiration among medical science historians for Rhazes and his achievements, echoes Nasr's praise, declaring that Rhazes "was probably the greatest and most original of all the Muslim physicians, and one of the most prolific as an author."[3]

Rhazes was born and grew up in Rayy, a city 6 miles southeast of Teheran. Perhaps surprisingly, he did not pursue medicine at first as a career. "In his youth," says Ibn Juljul, "he played on the lute and cultivated vocal music; but, on reaching the age of manhood, he renounced these occupations, saying that music proceeding between mustachios and a beard had no charms to recommend it."[4] However, he abandoned music only after he had already authored an encyclopedia on the subject, titled *On the Beauty of Music*. Rhazes next turned his attention to the study of Philosophy, but eventually gave it up, as he could not fathom Metaphysics nor its aims, and criticized those who could not make the subject understandable and concrete.

At this point in his still young life Rhazes decided that a change in scenery—that is, a move from Rayy to Baghdad—was in order. El-Sergany explains: "Although Rayy was full of scientists and scholars, it was not a city that embraced all the earth sciences at that time. Therefore, Rhazes headed to the world's center of knowledge, Baghdad, capital of the Abbasid Caliphate. He studied in an extensive exchange program and studied different sciences."[5] One of the sciences Rhazes studied and devoted much of his time to for quite a few years was chemistry or, as it was called in the Middle Ages, alchemy, a branch of science in which he made enormous contributions. Unfortunately, his contributions were cut short. Relates Nasr, "It has been said that, as a result of too strenuous experimentation with alchemical processes, his eyesight began to give way and it was in desperation that he gave up the practice of alchemy."[6] To better appreciate Rhazes' reluctance to abandon alchemy, it's important to know that he is "credited with major discoveries in this domain including that of alcohol and of certain acids."[7] In addition, Campbell informs us that later on as a physician "Rhazes was the first to introduce chemical preparations into the practice of medicine."[8] Clearly, it was hard to turn one's back to such progress. It must also be pointed out that Rhazes "had little interest in the alchemical world-view," and instead strove to create the science of chemistry;[9] this is demonstrated by his concern over the "external properties alone" of substances, which mirrors the concern and primary focus of chemistry.[10] We see Rhazes' scientific orientation in his discussion of the melting of iron:

> Take filings of iron, as much as you want, and having thrown on them one-quarter their weight of powdered red (arsenic sulfide), stir the mixture up. Then put it in a bag, and after luting it with good clay, place it in a hot oven. Afterwards take it out and weigh it. Then throw upon it one-sixth of its weight of (hydrated sodium carbonate) and add olive oil to the mixture. Next it is placed in a perforated crucible, fitted on to another. What comes down is received, and again melted. Then Salamoniac and Syrian vitriol—both powdered and mixed with olive oil—are taken and made into small balls, and it (the fused product) is fed with these. It may be melted as many times as you choose, for that adds to its fusibility and whiteness. If this process is repeated, the mass becomes so soft that it may be beaten out, and it will be as easily melted as silver.[11]

It was natural for Rhazes to lead alchemy into a new and more scientific direction; his personality and beliefs lent themselves to unfettered approaches to solving problems. According to biographer Soheil Afnan, he was "an independent thinker bent on speculation, fearless in the expression of his views," and entertained what most Muslims in his day regarded to be unorthodox religious views.[12] Though not an atheist, Rhazes "deeply shocked Muslim society by his assertion that there is no necessity for prophets whatsoever; and that any man who is sufficiently endowed with intelligence can use it to fashion his own life and achieve his own salvation."[13] These beliefs produced an equally revolutionary impact when applied to alchemy. Nasr notes that prior to Rhazes, alchemy "was concerned with both the external and symbolic or inward meaning of phenomena. Rhazes, by denying prophecy and therefore the possibility of this spiritual exegesis that is inseparable from it, also negated the symbolic dimension of alchemy and transformed it into chemistry."[14] This is why Rhazes, along with the 8th Century Persian scientist Jābir ibn Hayyān, has come to be known as one of the two early fathers of modern chemistry.

When his eyesight forced Rhazes to abandon alchemy, he fortunately found a new occupation to engage his genius. Elgood explains that about the age of 30 and being in Baghdad at the time Rhazes "had an experience which changed the whole of his life. He visited in a spirit of mere curiosity the Al-Muqtadirī Hospital and became interested in a conversation with the old pharmacist. He returned the following day and happened to meet a physician to the hospital who

showed him a human fetus with two heads. So interested was he in this and in what he heard from the druggist that he determined to study medicine for himself."[15] Rhazes then returned to his home city, Rayy, and pursued his new career in medicine whole-heartedly. El-Sergany continues the story as follows:

> He became director of the hospital at Rayy, one of the most advanced hospitals known to Islam and gained an unrivalled reputation in terms of his success in treating previously incurable cases. His achievements were known to all and eventually the Prime Minister of the Abbasid State, Ibn-Boyeh, invited him to become chief of medicine at 'Adudi Hospital in Baghdad. At the time, this hospital was regarded as one of the biggest hospitals worldwide, employing over 50 doctors. It was an institute of science and an advanced school of medicine as well.[16]

Browne provides us more detail about Rhazes' work routine at the hospital in Rayy: "He ultimately became chief physician, and there he attended regularly, surrounded by his pupils, and the pupils of his pupils. Every patient who presented himself was first examined by the latter—the clinical clerks, as we should say; and if the case proved too difficult for them it was passed on to the Master's immediate pupils, and finally, if necessary, to himself."[17]

One extremely interesting fact regarding the 'Adudi Hospital, which was Baghdad's greatest hospital and was where, as we've already seen, Rhazes ended up being its physician-in-chief (or *mutawallī,* as this position is called in Arabic), is how the location on where it was built was chosen. Browne informs us that Rhazes was instrumental in this matter, stating: "Being asked to select the most suitable site, he is said to have caused pieces of meat to be hung up in different quarters of the city, and to have chosen the place where they were slowest in showing signs of decomposition."[18] Although the theory of bacteria, which was not to be discovered until the early 17th Century CE, was unknown to Rhazes, he clearly possessed an intuitive understanding of hygienic principles far in advance of medieval era standards.

How Rhazes went about instructing his many medical school students at the Adudi Hospital can only be called impressive, keeping in mind that such instruction occurred well over 1100 years ago in the late 9th Century CE and early 10th Century CE. El-Sergany informs us:

> His teaching methods at the hospital involved two approaches: a theoretical and a clinical experimental approach. Rhazes taught his students medical books, giving lectures, holding scientific circles and taking his students on ward rounds to teach and explain certain cases. He taught his students medicine in three years, starting with theoretical then scientific topics in exactly the same way that medicine is taught nowadays. At the end of the third year, he gave out an exam consisting of two parts. The first test was in anatomy and the second was a practical test of the student's knowledge in treating patients. Those who failed the first part could not proceed to the second.[19]

El-Sergany next describes what a patient's first doctor's office visit with Rhazes would have been like, an experience similar to the one people meeting with their doctor today have:

> Rhazes was very keen on asking patients every detail about their disease, stating that a doctor should always ask his patient about every detail of his ailment. Medical history-taking is the first step in the treatment of a patient in modern medicine. Rhazes would start to examine each patient by measuring his temperature and pulse to ascertain if they needed to be admitted into hospital. The hospitalized patient would then be put under careful observation in order to record every single piece of information that might be useful in detecting the cause of the disease or in prescribing medication.[20]

The unparalleled skill Rhazes possessed in diagnosing and curing a serious health problem is well-illustrated in this interesting story related by Qādi Abu ‘Ali at-Tanūkhi (939-994 CE) in his book, *Relief after Distress*:

A young man of Baghdad came to Rhazes complaining of hematemesis [i.e., vomiting of blood]. Careful examination failed to reveal the cause or explain the symptom. The patient was in despair, believing that where Rhazes failed, none could succeed. Rhazes, touched alike by his distress and his faith, then proceeded to question him very carefully as to the water he had drunk on his journey, and ascertained that in some cases it had been drawn from stagnant ponds. “When I come tomorrow,” said he to the patient, “I will treat you and not leave you until you are cured, on condition that you will order your servants to obey me in all that I command them concerning thee.” The patient gave the required promise, and Rhazes returned the next day with two vessels filled with a water-weed called in Arabic *Tuhlub* and in Persian *Jāma-i-Ghūk* (“Frog’s coat”), which he ordered the patient to swallow. The patient, having swallowed a considerable quantity, declared himself unable to take any more, whereupon Rhazes ordered the servants to hold him on his back on the ground and open his mouth, into which he continued to cram more and more of the nauseous substance until violent vomiting ensued. Examination of the vomit revealed a leech which was the source of the trouble, and with its expulsion the patient regained his health.[21]

Muhammad ‘Awfi in his 1230 CE book on Persian anecdotes added to the above story, explaining that “the leech when swallowed in the drinking-water had attached itself to the mouth of the patient’s stomach and there remained until it was induced to transfer itself to the more congenial water-weed.”[22]

Rhazes’ contemporaries called him “The Experienced.” This next story of what most would have believed to be an impossible cure helps explain how he obtained his nickname. It turns out that although Baghdad constituted his home base, Rhazes was often on the road, travelling throughout the Arab Empire. A famous story is told by the 13th Century CE Islamic biographer Ibn Khallikān of how he brought a seemingly dead man back to life:

Rhazes visited Spain where, in passing through the streets of Cordoba, he saw a crowd collected round the body of a man who was said to have just fallen dead. He caused him to be beaten all over with rods, and particularly on the soles of his feet, by means which, in less than a quarter of an hour, he restored him to animation. Upon being questioned about this singular remedy, he said that he had seen it used with success in a similar case by an old Arab; and added that **“experience is of more use than a physician.”**[23]

During the Middle Ages plagues often broke out, claiming millions of lives. Rhazes and the Arab physicians recognized the contagious nature of these diseases and advised the public to go into quarantine. For this reason, the Muslim population weathered such outbreaks well, while the fairly ignorant Europeans dropped like flies.

One plague which frequently broke out was the smallpox. Rhazes is credited as being the first person to devise a successful cure for smallpox. His treatment of the disease relied on key principles of Preventive Medicine, with a most important one being that the patient’s own body defenses are what must be strengthened and stimulated. During a fever, Rhazes noted, the body’s natural defenses are most strongly manifested. He therefore recommended that the patient battling smallpox be treated by inducing a fever as soon as possible. As Rhazes states in his *Treatise on the Small-Pox and Measles*:

A patient that has the Small-Pox should be well wrapped up when the pustules are coming out, and carefully avoid the cold and breathing cold air; by which means he will recover.[24]

Rhazes strongly disapproved of any treatment which hindered this natural self-healing process, explaining:

> The pustules are a species of crisis, and for this reason the eruption is not to be checked, for that would be like checking the crisis, and might make the disease fasten upon some of the more important organs; and therefore, when you see symptoms of the pustules, you may be sure that Nature is inclined to throw out the humour to the surface of the body, and should aid her in this attempt by giving the patient suitable things to drink; and so not let the room in which he is placed be very cold, for this would hinder the eruption from coming out by obstructing the pores of the skin.[25]

Many modern-day scientific studies confirm the high regard that Rhazes held for the curative powers of fever. For example, researchers Ellen Foxman, James Storer, and Kiran Vanaja of the Yale University School of Medicine reported on page 8496 in their July 26, 2016 paper, "Two interferon-independent double-stranded RNA-induced host defense strategies suppress the common cold virus at room temperature," published in the *Proceedings of the National Academy of Sciences*, that cells infected with the common cold virus die more rapidly when the body's temperature is higher than its normal core temperature of 37 degrees C. Therefore, a fever which is properly controlled can be extremely beneficial—and not just for sick persons, but also for healthy people as well. This is evidenced by the results of a 1990-published study conducted by Ernst *et al* on how effective taking saunas is for preventing one from coming down with a common cold (see "Regular Sauna Bathing and the Incidence of Common Colds," 1990, *Annals of Medicine*, 22(4), pages 225-227). A sauna raises the body's core temperature, just like a fever does. In the above study 25 experimental subjects took saunas regularly over a 6-month period, and a control group of 25 subjects did not take any saunas. The study's results showed that the sauna group experienced only half the number of colds than the control group suffered.

Another principle of Preventive Medicine which Rhazes employed in his treatment of smallpox was his administration of plant-based (mainly herbal) preparations and nutritional drinks. He well knew that the natural defenses of the body's immune system cannot prove effective against disease if proper nutrition is not followed. One lady, seriously ill with smallpox, Rhazes treated this way:

> I immediately took care of her eyes and strengthened them by a collyrium of cuhl rubbed up in rose-water. In consequence of this not a single pustule came out in her eyes, though they were very thick all around. The old women who were waiting upon her were astonished at her eyes being preserved. I made her take barley-water and the like for some time; and as her bowels were not relaxed, as is the case at the end of this disease, and she had still some remains of ardent fever, I conjectured this to be the effect of the residue of the humours that did not pass off by the bowels, as usual. I could not venture to bring this away all at once on account of her weakness; so, I made her take the "Aqua Fructuum" in the morning, and barley-water in the afternoon, for a fortnight. This occasioned two motions every day, and a complete purgation. After forty days there appeared a perfect coction in the urine, and after fifty the patient was quite recovered.[26]

We pointed out earlier that Yuhannā wrote a work on barley water which, unfortunately, has not successfully survived the ages; and, we mentioned at the time that barley water has been found to provide immune system support. Rhazes' administration of barley water to his patient must be commended for an additional reason over and above its supportive immune system action. According to John Lust, who we recall is the author of *The Herb Book*, barley possesses the property of soothing irritate tissue, particularly mucous membrane, and "has also been recommended for feverish conditions."[27] To prevent pustules from breaking out in a patient's eyes,

the "collyrium of cuhl rubbed up in rose-water" that Rhazes successfully used on the above-described female patient of his, and also likely successfully used on the thousands of smallpox patients that he and the 'Adudi Hospital staff members treated, was a liniment to which he often added coriander and oil of camphor. Coriander and camphor appear to be excellent selections; when prepared in liniment form and applied externally, Lust notes that these herbs reduce or eliminate soreness, swelling, and pain.[28]

Smallpox leaves pit marks on the body. Rhazes states that they can be "removed by powdered reed roots, chips of wood of the willow tree, and white litharge."[29] Interestingly, there is a very good chance that this treatment Rhazes recommended would be effective; for Lust writes that a decoction of willow bark is good for "eruptions, sores, burns, and wounds."[30]

In contrast to all too many of today's Western allopathic doctors, Rhazes strongly believed that expensive and complicated methods of dealing with health problems were generally unnecessary and counterproductive. "When you can cure by regimen," he urged, "avoid having recourse to medicine; and when you can effect a cure by means of simple medicine, avoid employing a compound one."[31] He is also quoted as saying: "With a learned physician and an obedient patient, sickness will disappear," and "Truth and certainty in Medicine is an aim which is not to be attained; and the healing art, as it is described in books, is far inferior to the practical experience of a skillful and thoughtful physician."[32] These sayings indicate that Rhazes probably would not feel at home practicing in the same medical building or hospital with today's Western-trained doctors, many of whom think they know it all just because they survived several years of medical school and internship. Of course, getting through this lengthy initiation process does not make one a "learned physician," nor does learning more and more about less and less (i.e., specializing), the path that present-day allopathic medicine has embraced. To qualify as a "learned physician" in Rhazes' book one must meet several criteria, which he details as follows:

> If he has been very industrious in a diligent perusal and examination of the books of the ancient physicians, and has carefully read and compared their writings, we may justly form to ourselves a good opinion of him. On the contrary, if we find he has spent the greatest part of his time in anything rather than in what we have mentioned; if he seems to be much delighted in music, drinking, and other ill habits, we can entertain no great opinion of him. But if it is evident he has been all along very studious, the next point to be considered is his genius and sagacity, whether he has been very conversant with men able to dispute with and oppose him, and what just grounds we have to think he will ever arrive to the talents of inquiring into, as well as of curing, distempers; we ought to know in the next place what time he had spent in the conversation of those persons we just now mentioned, and whether he had acquired by their means the art of judging of a distemper, as well as relieving it. It will be material moreover to observe whether he well understands what he pretends to have studied, or no: if we find he does, the next inquiry will be whether he has been used to attend to the sick, and happy in the cure of them. We ought to be satisfied, whether he has practiced in popular cities, where there are great numbers of patients, as well as of physicians; and if upon inquiry we find that he is well qualified as to both these particulars, we may safely pronounce him an able physician, and to be made choice of before many others.[33]

Rhazes recognized that in certain cases the best treatment for a malady is clever application of psychology, and he never hesitated to try a psychological approach whenever the situation called for such. Few doctors today, though, utilize this tactic because 1) it does not enrich them or the pharmacists, and 2) you have to be halfway competent in its use to have any chance for success. Rhazes was more than competent in the use of psychology, as we see in the celebrated case involving Nasr II, the 10th Century CE ruler of Khurasan and Transoxiana (regions occupying the

eastern Persian plateau and lower central Asia). In this instance Rhazes saw in advance that he might have to devise and implement a plan that would alter his patient's mindset in order to effect a cure:

Amir Mansur ibn Nasr became afflicted with an ailment which grew chronic, and remained established, and the physicians were unable to cure it. So, the Amir Mansur sent messengers to summon Muhammad ibn Zakariyyā ar-Rāzī (Rhazes) to treat him. Muhammad ibn Zakariyyā came as far as the Oxus River, but when he reached its shores and saw it, he said, "I will not embark in the boat, for God Most High saith, *'Do not cast yourselves into peril with your own hands'*; and again it is surely a thing remote from wisdom voluntarily to place one's self in so hazardous a position." Ere the Amir's messenger had gone to Bukhara and returned, he had composed the *Kitāb-al-Mansūrī*, which he sent by the hand of that person, saying, "I am this book, and by this book thou canst attain thine object, so that there is no need of me."

When the book reached the Amir, he was grievously afflicted, wherefore he sent a thousand dinars and one of his own private horses fully equipped, saying, "Show him every kindness, but if this proves fruitless, bind his hands and feet, place him in the boat, and fetch him across." They did so, but their entreaties moved him not at all. Then they bound his hands and feet, placed him in the boat, and when they had ferried him across the river, released his limbs. Then they brought the lead-horse, fully equipped, before him, and he mounted in the best of humors, and set out for Bukhara. So, they enquired of him saying, "We feared lest, when we should cross the water and set thee free, thou wouldst cherish enmity against us, but thou didst not so, nor do we see thee annoyed or vexed in heart." He replied, "I know that every year twenty thousand persons cross the Oxus without being drowned, and that I too should probably not be drowned; still, it was possible that I might perish, and if this had happened they would have continued till the Resurrection to say, 'A foolish fellow was Muhammad ibn Zakariyyā, in that of his own free will he embarked in a boat and so was drowned.' So, should I be one of those who deserve blame, and not one of those who are held excused."

When he reached Bukhara, the Amir came in and they saw one another and he began to treat him, exerting his powers to the utmost, but without relief to the patient. One day he came before the Amir and said, "Tomorrow I am going to try another method of treatment, but for the carrying out of it you will have to sacrifice such-and-such a horse and such-and-such a mule," the two being animals noted for their speed, so that in one night they would go forty parasangs [Ed. note – 120 to 140 miles].

So, the next day he took the Amir to the hot bath of Ju-yi-Muliyan, outside the palace, leaving the horse and mule ready equipped and tightly girt in the charge of his own servant at the door of the bath; while of the king's retinue and attendants he suffered not one to enter the bath. Then he brought the King into the middle chamber of the hot bath, and poured over him tepid water, after which he prepared a draught, tasted it, and gave it to him to drink. And he kept him there till such time as the humours of his joints had undergone coction.

Then he himself went out and put on his clothes, and (taking a knife in his hand) came in, and stood for a while reviling the King, saying, "O such-and-such, thou didst order thy people to bind and cast me into the boat and to threaten my life. If I do not destroy thee as a punishment for this, I am no true son of (my father) Zakariyyā!"

The Amir was furious and rose from his place to his knees. Muhammad ibn Zakariyyā drew a knife and threatened him yet more, until the Amir, partly from anger, partly from fear, completely rose to his feet. When Muhammad ibn Zakariyyā saw the Amir on his feet, he turned round and went out from the bath, and both he and his servant mounted, the one on the horse, the other on the mule, and turned their faces towards the Oxus. At the time of the afternoon prayer they crossed the river and halted nowhere till they reached Merv. When Muhammad ibn Zakariyyā alighted at Merv, he wrote a letter to the Amir, saying, "May the life of the King be prolonged in health of body and effective command! I your servant undertook the treatment and did all that was possible. There was, however, an extreme failure in the natural caloric, and the treatment of the disease by ordinary means would have been a protracted affair. I therefore abandoned it in favor of psychical treatment, carried you to the hot bath, administered a draught, and left

you so long as to bring about a coction of the humours. Then I angered the King, so as to aid the natural caloric, and it gained strength until those humours, already softened, were dissolved. But henceforth it is not expedient that a meeting should take place between myself and the King."

Now after the Amir had risen to his feet and Muhammad ibn Zakariyyā had gone and ridden off, the Amir at once fainted. When he came to himself, he went forth from the bath and called to his servants, saying, "Where has the physician gone?" They answered, "He came out from the bath, and mounted the horse, while his attendant mounted the mule, and went off."

Then the Amir knew what object he had had in view, so he came forth on his own feet from the hot bath; and tidings of this ran through the city. Then he gave audience, and his servants and retainers and people rejoiced greatly, and gave alms, and offered sacrifices, and held high festival. But they could not find the physician, seek him as they might. And on the seventh day Muhammad ibn Zakariyyā's servant arrived, riding the mule and leading the horse, and presented the letter. The Amir read it, and was astonished, and excused him, and sent Muhammad ibn Zakariyyā an honorarium consisting of a horse fully equipped, a cloak, turban, and arms, and a slave-boy and a handmaiden; and further commanded that there should be assigned to him in Rayy from the estates of al-Ma'mun a yearly allowance of two thousand dinars in gold and two hundred ass-loads of corn. This honorarium and pension-warrant he forwarded to him at Merv by the hands of a man of note. So, the Amir completely regained his health, and Muhammad ibn Zakariyyā attained his object.[34]

Nasr, in his *Science and Civilization in Islam*, describes Rhazes as "a master of psychosomatic medicine and psychology" who "treated the maladies of the soul along with those of the body and never separated the two completely."[35] Nowadays, regrettably, Western allopathic medicine has fragmented itself into numerous specialized fields—pulmonology, rheumatology, podiatry, and so on; as a result, Western specialist physicians, while able to address the health problems outwardly manifested in the patient, lack sufficient training in discerning the underlying causes, which often are of a psychological or emotional nature, of the health problem presented by the patient. With the underlying cause of the patient's symptoms not being addressed, the patient's original symptoms often reemerge, and even new symptoms which also are related to the patient's psychological or emotional state can spring forth. In short, this is all too frequently the outcome when the effect is treated to the exclusion of the underlying cause. Rhazes, instead of specializing like so many doctors do today, worked hard at becoming an expert general practitioner. He learned that many hidden factors, such as one's mental condition, have a direct bearing on physical health. Continues Nasr, "He in fact composed a work on the medicine of the soul in which he sought to demonstrate the way to overcome those moral and psychological illnesses which ruin the mind and the body and upset the total state of health that the physician needs to preserve."[36]

The above work mentioned by Nasr is *The Spiritual Physick of Rhazes*, an entertaining book which contains sound reasoning paired with appropriate examples. This book has been translated into English and will prove for most people to be worth their while in reading due to the insights and advice Rhazes provides that are cause for reflection. We note, for example, a couple of parables in his chapter "On Greed":

I remember I was eating once with a certain man in Baghdad, and a huge quantity of dates was put before us. I refrained from taking more than a moderate amount, but he persevered until he had nearly finished the lot. When he was full and had ended eating, I noticed that he was goggling at the remainder as they were removed from the table; and so I asked him whether his soul was satisfied and his appetite assuaged. He answered, "I only wish I could be in my former state again, and this plate be put before us right now!" I said to him, "If the pain and gnawing of desire have not left you even now, would it not be better to refrain before you are full, so as to relieve yourself at least of the heaviness and distention of being

replete? The indigestion which you cannot be sure of not suffering is bound to bring upon you ailments that will be many, many times more painful for you than the pleasure you had in what you have taken." I saw that he understood my meaning, and that my words went home and did him good; and upon my life, such reasoning as this satisfies those who have not been trained in the discipline of philosophy, more than arguments based on philosophic principles.[37]

The object and purpose of feeding in created beings is not enjoyment but survival, which cannot be secured without food. This is illustrated by the story of the philosopher who was eating with a youth wholly undisciplined. The latter expressed surprise at the small amount the philosopher was taking, saying among other things, "If my whack of food was only as much as yours, I would not care whether I was alive or not." The philosopher replied, "That is quite true, my son. I eat in order that I may live, whereas you only want to live in order that you may eat.[38]

The taste buds on the tongue send taste sensations to the brain which generally last only one second after the food has left the tongue and been swallowed. Despite this fact, many people claim that they cannot give up ice cream, potato chips, cola drinks, and other highly-processed, preservative-saturated foods because these foods taste "so good." These people are making a fatal mistake. ***50 seconds of pleasurable taste per meal are not worth the hastening of one's death!*** As Rhazes wisely points out, eat in order that you may live, not live in order that you may eat.

We've seen earlier that studying medical books was one way that Rhazes' medical school students learned their profession. No doubt some of the works Rhazes brought to the attention of his pupils were ones he himself authored. Campbell informs us that "he is credited with about 237 works, the greater number of which are lost." His two most important and influential books were *al-Kitāb-al-Mansūrī* (*Liber ad Almansorem*), which was dedicated to al-Mansur, the prince of Khurasan, and *Al-Hāwī*, a posthumous work compiled from unfinished notes by Rhazes' pupils.[39] The above-mentioned first work was comprised of ten books, with the ninth book, called *Nonus Almansoris*, being the most influential in the Latin West. It was devoted to the various organs of the body—from head to toe. Its content was taken mainly from Hippocrates' *De morbis* and Galen's *De locis affectis, Methodi medendi*. Serving as a famous textbook of the Middle Ages, *Nonus Almansoris* was the subject of numerous commentaries, and formed part of the regular medical curriculum of the University of Tübingen at the end of the 15th Century. In addition, it was publicly read in the medical schools of Western Europe for hundreds of years. Haly Abbas, another remarkable Arabized Persian physician whose life and achievements we'll soon examine, stated that the brevity of the *Nonus Almansoris* was its only fault.[40] Campbell describes the significance of the much lengthier *Liber ad Almansorem*, of which the *Nonus Almansoris* forms just a part, this way:

This work was compiled from the writings of Rhazes' predecessors, and its value lies not so much on its original matter as on its voluminous form, far surpassing Galen in this respect, and its demonstration of the carrying over of Greek Medicine to the Arabians.[41]

In regard to Rhazes' book, *Al-Hāwī* (called "Continens" by the Latin Europeans), its complete title in Arabic is *Al-Hāwī fī al-tibb* , which in English is "The Comprehensive Book on Medicine." And comprehensive it certainly is. Campbell provides us this summary of the work:

Al-Hāwī, the largest and most important of Rhazes' medical works, was an encyclopedia of medicine and surgery containing a summary of all the branches of the art and science of medicine in twenty-five books. This work exceeds the *Canon* of Avicenna and was one of the nine volumes which composed the whole library of the medical faculty of Paris in 1395. This work, like *Liber ad Almansorem*, shows

Rhazes as a follower of Hippocrates in theory and of Galen in practice. The ninth book of the "Continens" deals with pharmacology and was a source of therapeutic knowledge in Europe long after the Renaissance.[42]

El-Sergany adds to the above facts that in *Al-Hāwī* Rhazes "compiled information on all his clinical experiences. It was the biggest book ever printed after the invention of the printing press, coming out in Latin in 1486 in 25 volumes."[43] So big, in fact, that a translation of the complete work into English has never even been attempted. One can well understand why this masterpiece work of Rhazes has largely remained in its Latin version when one sees what just a very small section of *Al-Hāwī* contains. Browne tells us that in Volume 17 of *Al-Hāwī* Rhazes relates, among other things, 24 detailed cases of patients he treated, providing their full names, their symptoms, the treatment administered and the results. An abbreviated account of one such case Rhazes detailed is as follows (Rhazes' actual account is twice as long):

> Abdu'llāh ibn Sawāda used to suffer from attacks of mixed fever, sometimes quotidian, sometimes tertian, sometimes quartan, and sometimes recurring once in six days. These attacks were preceded by a slight rigor, and micturition was very frequent. I gave it as my opinion that either of these accesses of fever would turn into quartan, or that there was ulceration of the kidneys. Only a short while elapsed ere the patient passed pus in his urine. I thereupon informed him that these feverish attacks would not recur, and so it was.
>
> When he passed the pus, I administered to him diuretics until the urine became free from pus, after which I treated him with terra sigillata, Boswellia thurifera, and Dragon's Blood, and his sickness departed from him, and he was quickly and completely cured in about two months. That the ulceration was slight was indicated to me by the fact that he did not complain to me at first of weight in the loins. After he had passed pus, I enquired of him whether he had experienced this symptom, and he replied in the affirmative. Had the ulceration been extensive, he would of his own accord have complained of this symptom. And that the pus was evacuated quickly indicated a limited ulceration. The other physicians whom he consulted besides myself, however, did not understand the case at all, even after the patient had passed pus in his urine.[44]

As a postscript to the above case, the patient's first doctors had misdiagnosed the problem as being malarial in origin, but Rhazes, after observing pus in the patient's urine, correctly diagnosed the case as being septic in origin—specifically pyelitis, and accordingly treated it successfully.

Now, the question is: why did the terra sigillata, Boswellia, and Dragon's Blood preparation that Rhazes gave his patient with the kidney ulceration work? In order to see why the preparation worked, let's examine the effects that each component of the preparation has on the body. For starters Annette Frolich tells us on page 9 in her 2008 paper, "Terra Sigillata—A Remedy Used Through Millenniums" (published in *Dansk Medicinhistorisk Årbog*, 2008, Vol. 36, pp. 9-20) this: "Terra sigillata is clay. It has been used for different diseases through centuries, even millenniums. This specific clay has been used from Hippocrates until the 20th Century, mostly for the same kind of diseases, mostly various poisonings." Meanwhile, since ancient times Dragon's Blood, the bright blood red resin from different plant species, but especially from tropical and subtropical palm plants, has been used as a cure-all. Deepika Gupta *et al* explain on page 361 in their paper, "Dragon's Blood: Botany, Chemistry, and Therapeutic Uses" (published in *Journal of Ethnopharmacology*, Vol. 115, Issue 3, February 12, 2008, pp. 361-380) that "Dragon's Blood is one of the renowned traditional medicines used in different cultures of the world. It has got several therapeutic uses: haemostatic, anti-diarrhetic, antiulcer, antimicrobial, antiviral, wound healing, antitumor, anti-inflammatory, antioxidant, etc." Finally, in 2013 J. Moreillon *et al*

conducted a study in which 16 chronic kidney disease patients randomly received a supplement containing Boswellia and curcumin or a placebo. After 8 weeks the study found that the Boswellia/curcumin supplement "helped to improve the levels of an inflammatory cytokine," the inflammatory cytokine being interleukin-6. (See "The Use of an Anti-inflammatory Supplement in Patients with Chronic Kidney Disease," *Journal of Complementary and Integrative Medicine*, Vol. 10, 2013, page 1). We recall that Rhazes' patient had a limited ulceration in his kidney, a problem that Dragon's Blood specifically addresses. The Boswellia and terra sigillata, with their anti-inflammatory and anti-poisoning properties, no doubt added to the effectiveness of the preparation the patient received from Rhazes.

Given the above case, it is not surprising that we learn from Browne that Rhazes wrote a monograph on kidney stones. He also wrote one on the bladder. Further, besides *Al-Hāwī* and *Liber ad Almansorem*, he authored general works on medicine, such as: *Jāmi* or "Compendium"; *Kāfi* or "Sufficient"; the Lesser and Greater *Madkhal* or "Introduction"; the *Mulūkī* or "Royal"; the *Fākhir* or "Splendid;" and "Doubts about Galen," a book in which he highlighted the mistakes in Galen's ideas and then provided his own suggestions, describing the process by which he reached his conclusions. In addition, he wrote treatises on rheumatism, colic, gout and nocturnal enuresis (nighttime bed-wetting).[45] These latter two we'll now examine.

Saeed Ashtiyani and four co-researchers studied Rhazes' "Treatise on Gout" (*Maqale fi al-Naqras*), comparing what Rhazes determined are the causes of gout and what its treatment should be versus how modern medicine accounts for and treats this disease. After concluding their research, Ashtiyani *et al* published their findings in a February, 2012 paper, "Rhazes' Prescription in Treatment of Gout" that appeared in the *Iran Red Crescent Medical Journal* 14(2), p.108-112.

Before going into detail regarding the findings of this study, we'll spare the reader any suspense by reporting its remarkable Conclusion: **"This study showed that the findings of Rhazes about treatments of gout were consonant with modern medical theories."**[46] What makes this conclusion so remarkable is the fact that Rhazes wrote his treatise on gout over 1,100 years ago during the Early Middle Ages!

Why the paper's authors came to their above conclusion that Rhazes' treatments of gout were in accord with those of present-day medicine we'll now explain. In examining Rhazes' treatise on gout, Ashtiyani *et al* found that in this work "Rhazes stated all aspects and causes of gout, its differentiation, clinical features, methods of treatments and some dietary suggestions for the treatment of this disease."[47] Ashtiyani and his co-researchers then proceed to compare the extent to which Rhazes and modern medicine agree with respect to three main areas: 1) causes of gout; 2) methods of gout treatment; and 3) dietary recommendations for gout sufferers.

Starting with the causes of gout, the researchers provide this interesting comparison between what modern medicine and Rhazes have to say on this matter:

So far, several studies have shown that the most important risk factor for gout is a high level of serum uric acid which results in urate crystal formation in the articular, periarticular, and subcutaneous tissues. Furthermore, it includes some of the dietary risk factors such as meat, seafood, beer, wine, liquor, and purine-rich vegetables. Rhazes stated that "Gout is abnormal phlegm that through blood reaches the joints and involves them and they gradually get hardened and become stone-like." Furthermore, "Gout occurs as a result, namely, of the co-existence of two predisposing factors, namely stoutness of the body

and good health and equal vigor of all its organs. Furthermore, gout occurs as a result of the aggregation of metabolic excess in the blood." **Statements of Rhazes are consonant with the above-mentioned studies.**[48]

Ashtiyani *et al* next turn their attention to comparing the recommendations of present-day medicine and Rhazes with respect to the methods of treating gout:

Today, several studies indicate that lifestyle modifications such as reducing alcohol intake, losing weight gradually, and limiting protein and purine content in diet (which increase uric acid levels in blood), drinking plenty of water throughout the day, always keeping hands and feet well covered and warm in cold months (gout attacks are very common during the cold months) can go some ways towards reducing the frequency or likelihood of gout incidence.

Rhazes listed many procedures for the management of gout, such as: 1) Abstinence from restricted diet; 2) Compliance with fluid and dietary regimens regarding the emphasis on certain food types and drinks; 3) Administration of laxatives; 4) Steam baths.

Roddy *et al* indicated that the prevalence and incidence of gout have increased in the last few decades because of lifestyle and dietary factors. **Here again, this idea is in agreement with that of Rhazes'.**[49]

The final comparison between Rhazes and modern medicine the researchers present in their paper deals with the important matter regarding the dietary recommendations for gout, specifically recommended foods and recommended dietary restrictions.

Recommended foods for gout (modern medicine):

Several studies suggest the following dietary recommendations for gout: Fresh cherries, strawberries, blueberries, bananas, celery, tomatoes, vegetables, including kale, cabbage, parsley, green-leafy vegetables, foods high in bromelain (pineapple), foods rich in Vitamin C, fruit juices and purified water, low-fat dairy products, coffee, tea, and essential fatty acids (tuna, salmon, flaxseed, nuts and seeds).

Recommended foods for gout (Rhazes):

Rhazes stated that "cereals are generally not recommendable; however, the least pernicious of which are beans and gram peas for gout sufferers having biliary blood, and rice and chickpeas for patients with phlegmatic blood. Furthermore, eggs are restricted unless they are soft-boiled and eaten by sipping. As for dried fruits, the most recommendable are almonds. Patients with gout are allowed to have fresh fruits of moderate sweetness, such as fully ripened grapes, figs, apples, pomegranate, quince and pears. Vegetables are totally restricted except for lettuce, endives, dodder and celery for they do the least harm to gouty patients.[50]

Recommended dietary restrictions for gout (modern medicine):

Several studies have shown that people suffering from gout should avoid the following foods and beverages: Anchovies, bacon, goose, heart, liver, mussels, mutton, pheasant, sardine, salmon, scallops, trout, turkey, veal, and yeast. In fact, it is best to restrict all kinds of alcohol, because it can increase the level of uric acid in the body.

Recommended dietary restrictions for gout (Rhazes):

Rhazes stated that "Gouty patients should forsake camel's meat, beef, salted jerked meat, as well as dried game meat. As regards fish, it is advisable to avoid all kinds of salted fish, as well as stinking rigid-flesh fish. Dairy products should be all forsaken except for small amounts of milk, cooked with rice. It is also advisable to refrain from increased intake of certain types of dried fruits viz. walnuts, dried dates, unripe dates, honey, pine seeds, Syrian carob beans, etc.[51]

Ashtiyani *et al* sum up the above comparison by pointing out that "in short, Rhazes tried to present methods of treatment for attenuating inflammation," which is exactly what modern medicine also attempts to achieve in its treatment of gout.[52]

Let us now see if Rhazes' treatment of nighttime bed-wetting, technically called nocturnal enuresis, is similar to how present-day doctors treat the condition. Once again, Saeed Ashtiyani and his colleagues examined a work by Rhazes on this topic. They reported their findings in an August, 2013 *Iran Red Crescent Medical Journal* paper, "Rhazes, a Genius Physician in the Diagnosis and Treatment of Nocturnal Enuresis in Medical History." Knowing what we already know about Rhazes' expertise, we will not be surprised by what the study's authors state in their paper's Abstract: **"Our findings proved that Rhazes described the symptoms, signs, and the treatment of nocturnal enuresis in accordance with contemporary medicine."**[53]

Ashtiyani *et al* begin their paper with an explanation of what nocturnal enuresis is, its prevalence in the general population, and its effect on the person afflicted with this condition. "Enuresis" is the medical term for bed-wetting. So, "nocturnal enuresis" is bed-wetting at night. It is, continue Ashtiyani and his paper's co-authors, "the involuntary loss of urine in sleep in a child aged five years or more. 20% of five-year-olds experience nocturnal enuresis (NE). By age of 12, 3% of children experience NE; after age 15 1% of the populations continues to suffer from NE which persists into adulthood. NE can become a significant problem afflicting children and their families, often having a deleterious effect on the child's self-esteem, behavior, development of social skills, and quality of life."[54]

As one can guess, the key section of this paper by Ashtiyani *et al* is the one which presents the treatment protocols for nighttime bed-wetting recommended by Rhazes and contemporary medicine. In the case of Rhazes, his treatment protocols for nocturnal enuresis called for:

1) Refraining from taking any liquids at night.
2) Minimizing the amount of food consumed for dinner.
3) Prescription of appropriate medications and certain foods.
4) Providing special training for conditional learning in patient using psychological approach.

Modern medicine approaches include:

1) Fluid management which constitutes a change in the daily drinking pattern with encouragement of drinking fluids during the morning and afternoons and cutting back late evening drinks, particularly after dinner and before bedtime.
2) Having an early dinner and stopping liquid intake from two hours before going to bed are usually recommended.
3) Anticholinergic drugs in patients with signs of bladder instability should be considered.
4) Relieving anxiety and stressful conditions are of utmost importance.[55]

It is quite unlikely that Rhazes would have given a child or anyone else suffering from NE an anticholinergic drug which we see is included in the above modern medicine list of treatments for NE, as a person taking an anticholinergic drug can experience one or more troubling and potentially dangerous side effects, such as: memory loss, light-headedness, confusion, blurred vision, constipation, and dry-mouth. With respect to memory loss, Kathryn Richardson *et al* conducted a study of 66,136 dementia patients and 283,933 controls; their study's results were written up in a paper, "Anti-cholinergic Drugs and Risk of Dementia: Case-control Study," which appeared in the April 25, 2018 issue of *BMJ* (*British Medical Journal*). The study's key finding: "A robust association between some classes of anti-cholinergic drugs and future dementia incidence was observed."[56] This finding, along with other problems associated with taking prescription drugs, helps explain why, as El-Sergany points out, Rhazes "avoided the use of

chemical drugs if there was a chance that the patient's ailment could be treated with herbal medicine and through a change in diet."[57] Indeed, Ashtiyani *et al* provide the following Conclusion in their paper which reinforces the point made by El-Sergany:

A review of the opinion of Rhazes and other ancient Islamic medical textbooks on nocturnal enuresis reveals that medical practice in those days was comparable to modern medicine, yet avoiding the side effects that are commonly experienced with the modern medical approach.[58]

As if the many accomplishments of Rhazes that we've already related aren't enough, we also need to understand that he is responsible for many "firsts" that greatly advanced the practice of medicine, benefitting mankind in the process. For example, El-Sergany tells us that "Rhazes was renowned for his precision to an extent that astonished those who read his notes on pathological cases. What is more astonishing is that Rhazes was one of the first to carry out drug tests on animals, such as monkeys, to see how safe a drug was. Nowadays most drugs are not approved unless they are first tested on animals."[59] In addition, thanks to his strong work ethic and unique scientific approach (no doubt developed during his years as a chemist), Rhazes achieved several medical discoveries and breakthroughs, such as:

1) The invention of suture which he constructed from cat guts. This invention was used by doctors for centuries after his death.
2) The differentiation between venous and arterial hemorrhages, using finger pressure to stop a venous hemorrhage and a bandage to stop the arterial one in the same way as modern medicine.
3) The description of cataract extraction.
4) Considering fever as a symptom, not a disease.
5) The introduction of laxatives to pharmacy.[60]

The above list of wide-ranging discoveries well illustrates another insight about Rhazes that El-Sergany provides us: "What characterized Rhazes was that he searched for knowledge from every source and exerted much effort to learn as much as possible. This process was followed by careful thought, numerous experiments, and meticulous studies, to the extent that he was always analyzing, criticizing and modifying theories, until he reached the stage of innovation and invention."[61] Given Rhazes' perfectionistic ways in trying to understand a problem, we cannot be surprised to learn that this famous statement, which is regarded as perhaps the most important law of science—"**Whenever a prevailing theorem and a real fact are contradictory, the latter is to be accepted as true no matter how wide the extent to which the theorem is acted upon**"—was first made by him.[62] To emphasize his point, he also asserted, **"When reality contradicts a prevailing theory, one should always accept reality no matter how great the scientist who coined it."**[63]

An extremely important "first" by Rhazes which we haven't yet mentioned, but which deserves to be, is the fact that he authored the world's first-ever treatise solely dedicated to pediatrics (children's health). Around the year 900 CE when he would have been 35 years old he published a book whose Latin title, *Practica Puerorum* ("A Treatise on Pediatric Diseases"), is the one people most commonly use in referring to the work. *Practica Puerorum* contains 24 chapters, some of which are: sleeplessness, epilepsy, cough, worms, hernia, bladder stone, diseases of the teeth, sanious matter running from the ears, and constipation. These chapters, as one can guess, contain Rhazes' description of various childhood diseases and afflictions along with their respective treatments and remedies. Houchang Modanlou, MD in his 2015 *Archives of Iranian Medicine* paper, "Medical Care of Children during the Golden Age of Islamic Medicine," informs

us that "Rhazes differentiated osteomyelitis from other swellings of the bones in children and was the first to describe spina bifida." In addition, he "placed great emphasis on bathing the child and warned against use of ointments, which could only trap dirt and excrements;"[64] and given the era in which Rhazes lived, where indoor plumbing, for example, was essentially nonexistent for common people and epidemics were not infrequent occurrences, carrying out proper hygienic practices may easily have provided one's child more health benefits than doing anything else (such as having the child eat a good, balanced diet, etc.). Rhazes took up the topic of children's health in other works of his. Modanlou tells us that in *Al-Hāwī*, for instance, "Rhazes listed as signs of viability in newborns passing urine, sneezing, or crying."[65] Without elaborating any further on Rhazes' efforts to develop this field of medicine, we will simply point out that many consider his contributions so valuable that they regard him as **The Father of Pediatrics.**

Looking at Rhazes' personality a little closer, seeing if he was the type of man you would want to have as your next-door neighbor, we are informed by El-Sergany that "he was a very well-behaved man, renowned for his generosity, compassionate to the poor and sick, providing for them and in some cases giving them jobs. He advised his students to be motivated primarily by caring for patients and not by financial reward; in addition, he told them to give equal care and attention to the poor as well as the rich."[66] Although Rhazes lived an extremely productive life, he died in 925 CE blind and penniless, with the blindness eventually developing from the damage caused to his eyes from his earlier-in-life years as a chemist. His austere financial position was a matter of personal choice, for Rhazes totally devoted his life as a physician to his patients and research, and was too kind-hearted to accept compensation from of those he helped, especially the poor.

It should be mentioned that nowadays Rhazes' blindness could probably have been prevented, as his main problem seems to be that he had thick cataracts in both his eyes, and cataract surgery has been for years a fairly routine, highly successful procedure in the developed world. The story has come down to us that Rhazes "was at first inclined to have an operation performed on his eyes; but, when the surgeon who came to perform it could not tell him how many membranes the eye contained, he refused to let him touch them; and when someone represented to him that, if he would allow the operation to be performed, he might recover his sight, he said, 'No, for I have seen so much of the world that I am weary of it.'"[67] This story shows that in his sunset days the attractions of life no longer aroused Rhazes' interest. One possible explanation for this is that years before he had already come to grips with the question of death and had made his peace (a wise thing to do, for making a person live forever is not one of the miracle cures that following Preventive Medicine and wholistic health principles can bring about). We can see that Rhazes had set his mind at ease with respect to his future passing in *The Spiritual Physick of Rhazes* where he argues why one need not fear death. In his chapter "Of the Fear of Death" Rhazes reasons as follows:

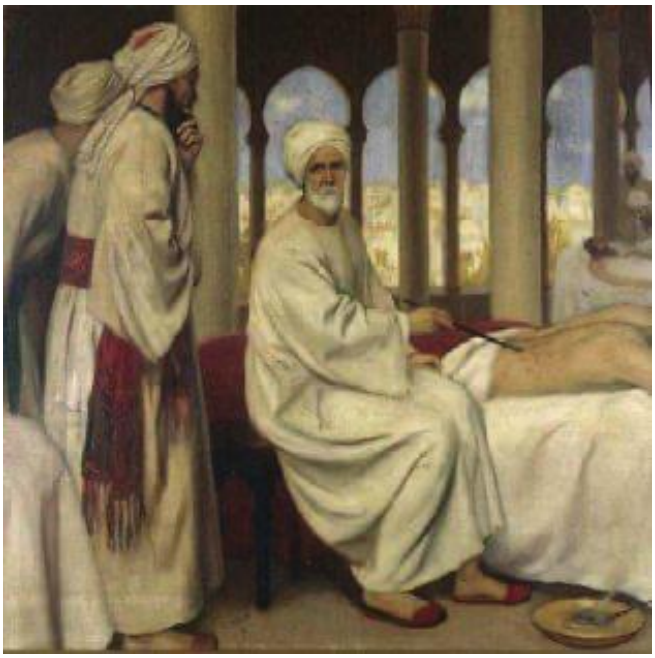
> Man … will after death be affected by no pain whatsoever; for pain is a sensation, and sensation is a property only of the living being, who during the state of his life is plunged and saturated in pain. Now the state in which there is no pain is obviously more salutary than the state in which pain exists; death is therefore more salutary to man than life.
>
> If it be objected that man, even though he be afflicted during his lifetime by pain, nevertheless also experiences pleasures which will not fall to him after death, the reply to this is a question: will he feel pain, or will he care or be troubled in any way whatever when he is in that state, merely because he cannot enjoy any pleasure? If the response to this be no—and so it is bound to be, because if this response is not given the implication will be that a man is alive even when he is dead—then it may be observed again that pain

affects only the living and not the dead; and so the objection is met by the remark that man will not be troubled by the fact that he cannot enjoy any pleasure. This being so, the argument returns to the point where it started, namely that the state of death is the more salutary.[68]

He continues:

Again, I repeat that I have demonstrated that there is no ground for fearing death, if a man holds that there is no future state after death. And now I say that in accordance with the other view—the view that makes out a future state attendant upon death—there is also no need for a man to fear death, if he be righteous and virtuous, and carries out all the duties imposed upon him by the religious law which is true; for this law promises him victory and repose and the attainment of everlasting bliss.[69]

In contemplating such a life as that of Rhazes, all words of eulogy seem weak and frivolous. When now and then in the course of the centuries such a life is brought into this world, the memory of it must be cherished by mankind as one of its most precious possessions. For the thoughts, the words, the deeds of such a man, there is no death. The sphere of their influence goes on widening forever as they bud, blossom, and bear fruit, from age to age.



8. Haly Abbas and *The Royal Book*

Al-Tabarī, Rhazes, Haly Abbas, and Avicenna are regarded as the 4 founders of Islamic Medicine, with the careers of the latter two flourishing during what's sometimes called the Silver Age of Arab Medicine when the Buwayhids (Shia Turks) ruled the Eastern Caliphate. Let's turn our attention to the first of these latter two physicians and examine the life and career of Haly Abbas.

'Alī ibn al-'Abbās al-Majūsì, known in the West by the Latinized name Haly Abbas, was born around 930 CE in the old southwestern Persian city of Arrajan. The "al-Majūsī" part of his name means "The Magian," and seems to show that he was of Zoroastrian heritage (the Zoroastrian religion persisted for quite a long time in some areas of Persia after the Arabs had completed their conquest of Persia in 654 CE). Early in his life he moved 120 miles to the southeast to the important city of Shiraz where he studied medicine under a very knowledgeable physician, Abū Māhir Mūsā ibn Sayyār, who himself had written works on surgery, phlebotomy and general medical topics. Haly Abbas must have received first-rate training and instruction from Abū Māhir, for Elgood informs us that during his career Haly Abbas "refers to him in grateful terms more than once."[1]

The following short summary of Haly Abbas' life merits our attention; it appears in al-Qiftī's biographical dictionary, "History of Learned Men," written in the early 13th Century:

'Alī ibn al-'Abbās al-Majūsī was an accomplished and perfect physician of Persian origin and was known as "the son of the Magian." He studied with a Persian professor known as Abū Māhir and also

studied and worked for himself with the writings of the Ancients. He composed for the king ‘Adud-al-Dawla the Buwayhid his system of medicine entitled *Kitāb al-Malikī*, which is a splendid work and a noble thesaurus comprehending the science and practice of medicine, admirably arranged. It enjoyed great popularity in its day and was diligently studied until the appearance of Avicenna’s *Canon*, which usurped its popularity and caused *al-Malikī* to be somewhat neglected. The latter excels on the practical and the former on the scientific side.[2]

Haly Abbas’s *Kitāb al-Malikī* encyclopedia on medicine and surgery is more commonly called *The Royal Book*, and it became the standard textbook for medical students during the medieval centuries. As already mentioned above, *The Royal Book* was written by Haly Abbas for his patron ‘Adud-al-Dawla, who originally in 949 CE served as the emir of the southern Persian district of Fars. Eventually, after defeating several rivals in battles, ‘Adud-al-Dawla became not only the ruler of the Buwayhid dynasty, but also the most powerful ruler in the entire Middle East. He assumed the ancient Persian title of Shahanshah (“King of Kings”) and ruled over a vast territory stretching from the southern coast of present-day Pakistan to the Mediterranean Sea to Yemen. He held his royal court in Shiraz and only occasionally visited Baghdad. In this royal court Haly Abbas served as ‘Adud-al-Dawla’s personal physician, and perhaps it was the influence of Haly Abbas that led the king to order the construction of the famous ‘Adudi Hospital in Baghdad which, when completed in 981 CE, became Baghdad’s largest and greatest hospital.

Let us now focus on *The Royal Book* whose lengthier formal title is actually *The Complete Book of the Art of Medicine* (*Kitāb Kāmil al-sinā‘ah al-Tibbīyah*). *The Royal Book* is divided into 2 parts—theoretical and practical medicine. Each part contains 10 tracts on specialized topics; so, the book contains 20 total tracts. The comprehensiveness of *The Royal Book* is exemplified by this description of four of its tracts, provided to us by Naser Puyan in his 2008 paper, “Haly Abbas, Iranian Celebrated Physician who wrote an excellently organized Medical Compendium” (published in *Quarterly Journal of Medical Ethics*, Vol. 2, No. 5, Fall, 2008):

Tract V: It contains 38 topics about generalities affecting and influencing one’s health and well-being, like: air, sport, bathing, aliments, drinks, flowers and perfumes, clothes, sleep and wakefulness, etc.

Tract XII: This tract has 57 topics concerning treatment of diseases and various means of their remedy.

Tract XIX: This tract containing 110 topics includes an entire course of surgery until Haly Abbas’s time.

Tract XX: It has 30 topics and includes a complete course on pharmaceutics, Pharmacology, and procedures on recipe-writing.[3]

Mojtaba Heydari *et al* took a closer look at one of *The Royal Book’s* sections and made a remarkable discovery concerning Haly Abbas’ research on jaundice. Writing in their 2014 paper, “Haly Abbas and the Early Description of Obstructive Jaundice” (published in *Iranian Journal of Public Health*, Vol. 43, No. 8, August, 2014) Heydari *et al* share with us what they discovered:

The knowledge of differentiation between hepatic and post-hepatic jaundice was unknown to ancient physicians. Modern literature often points to Albrecht von Haller as being the first to describe obstructive jaundice in 1764. Our investigations elucidated that **Haly Abbas (930-994 CE), a medieval Persian physician, introduced this disease and its characteristic clinical findings approximately 800 years prior to him.**[4]

Going into greater detail, the paper’s authors next present Haly Abbas’ clinical findings on jaundice, stating as follows:

Gastrointestinal issues are one of the main topics discussed in *The Royal Book*. Haly Abbas specifically discussed Jaundice in the Thirty-Third Subsection, "On the Conditions Affecting Gallbladder, Their Causes and Manifestations." Haly Abbas pointed to the post-hepatic jaundice as follows: "… and sometimes the obstruction occurs within the ducts connecting the gallbladder to the bowel; the bile amount increases and flows back toward the liver, and distributes through the blood in the body…" Haly Abbas enumerated the clinical manifestations resulting from post-hepatic obstruction, including icteric skin and sclera, dark urine and pale stool. He explained that the pale stool is only present in the post-hepatic form of the disease.

In short, for the first time in the history of medicine, Haly Abbas distinguished between hepatic and post-hepatic jaundice.[5]

An insight into how Haly Abbas got to the point to where he was able to figure out that there was a difference between hepatic and post-hepatic jaundice is provided by this saying of his, which appears in *The Royal Book*:

A medical science seeker, in order to develop his knowledge and extend it to a higher level, has to practice medicine in hospitals or with patients in their homes in front of wise teachers and ingenious physicians. In this way, he becomes informed of an ailment's commencement and the end, its goodness and badness, various diagnoses, and other conditions of the patients. If a physician practices like this, he will acquire an exalted position in medicine.[6]

As we see in his above saying, Haly Abbas mentions the importance of working with "wise teachers and ingenious physicians" in developing one's skill in becoming an outstanding physician. We learned earlier that Haly Abbas studied medicine under the very accomplished Abū Māhir. But, there appears to have been another major influence in the development of his medical expertise—Rhazes. Golnoush Nezhad *et al*, in their 2015 paper, "Haly Abbas' Pulsology" (published in *Research on History of Medicine*), point out the following: "Haly Abbas' knowledge of the pulse shows several similarities to that of Akhawayni (? - 983 CE) who was a student of Rhazes and surely was under the influence of Rhazes' medical knowledge. Therefore, it can be concluded that Haly Abbas was himself under the influence of Rhazes' medical knowledge and teachings."[7] Nezhad *et al* add that the influence of Rhazes on subsequent generations of physicians cannot be underestimated, pointing out that "this chain of Golden Age physicians, beginning with Rhazes, played a main role in transferring, modifying and improving medical knowledge that had survived from the time of ancient physicians."[8]

That Haly Abbas' expertise as a physician was developed under the influence of Rhazes cannot be doubted, for Haly Abbas was thoroughly familiar with Rhazes' *Al-Hāwī* medical encyclopedia. According to Puyan, Haly Abbas criticized one aspect of *Al-Hāwī*, where Rhazes "treated his subject at too great length and made his book too voluminous. This was the reason why most scholars were not able to order and purchase copies of the book, except for a few wealthy literary men, and so copies are scarce."[9] Nonetheless, Haly Abbas found on the book's positive side that Rhazes "mentions in it everything the knowledge of which is necessary to the medical man concerning hygiene and medical and dietetical treatment of diseases and their symptoms. He did not neglect the smallest thing required by the student of this art concerning treatment of diseases and illnesses."[10] Despite his reservations over *Al-Hāwī's* sprawling, somewhat disorganized nature, Haly Abbas had nothing but praise for Rhazes' professional expertise, stating: "Far be it from me to contest his excellence or to deny his knowledge of the medical art or his eminence as an author."[11]

Haly Abbas' excellence as a physician could hardly be called less than that of Rhazes. Nezhad *et al* state that in his day Haly Abbas's knowledge of cardiovascular medicine was unequalled. This is seen in his detailing in *The Royal Book* the many different types of pulse that present themselves. For starters, he pointed out that the "heart and the arteries move at the same time and in a unique pattern, and without any inconsistency, in such a way that one's movement can be predicted with the movement of another one. Thus, by checking the pulse we can understand the heart movement."[12]

Despite Haly Abbas' complete familiarity with the arteries located in the ankle, the neck, and the back of the foot, he recommended that the radial and ulnar arteries of the wrist be the places where one should take the patient's pulse. In addition, he recommended use of the index finger and little finger (fingers 2 and 5), and not the thumb, to detect the pulse. With respect to those students of his who were pursuing a medical career, he emphasized the importance of working hard to achieve the desired skill of differentiating the various types of pulse, as well as developing the ability to detect any minute change in the normal pulse pattern.

Haly Abbas found and taught his students that the types of pulse could be classified eight different ways:

1) According to the amount of arterial dilation;
2) According to the duration of the pulse;
3) According to the force;
4) According to the consistency of the palpable artery;
5) According to the temperature quality of the artery;
6) According to the duration of pause in pulse cycle;
7) According to the duration of each pulse beat with the pulse-to-pulse interval;
8) According to the amount of arterial dilation in different pulse cycles.

In addition, Haly Abbas found that each of these eight main pulse classifications could be subdivided in three or more ways. For example, the type of pulse according to force could be a strong pulse (hits fingertips forcefully), a weak pulse (hits fingertips weakly) and an intermediate pulse. Furthermore, sometimes a patient would have an inconsistent pulse, and Haly Abbas identified several different types of inconsistent pulses.[13] In short, there were hundreds of different possibilities that could describe the type of pulse a patient possessed, but only one of these possibilities was, of course, the correct one, and Haly Abbas was able to determine this.

Haly Abbas next detailed in *The Royal Book* the many factors that affect one's pulse, such as: age, exercise, sleep, body size, foods and drinks. For example, he noted not only the higher pulse rate that children (especially at a younger age) possess versus the lower pulse rate present in older people, but also how common it is to find an inconsistent pulse pattern in the older age group. Regarding the importance of disease and psychological/emotional factors in determining one's pulse, Nezhad *et al* point out that Haly Abbas addressed these influences as well, stating:

> He explained the role of the pulse in different diseases. For instance, he explained a condition in which the heart's strength becomes weak; consequently, the pulse becomes weaker and faster than normal. These descriptions could be attributed to what is known as heart failure in modern medicine and its related pulse pattern.

Psychological factors, such as fear, grief, anger, and happiness, are underlying principles that can influence the changes in pulse pattern. For example, anger: he explained that in this state, the pulse becomes strong and fast. These statements could be regarded as an early description of psychosomatic reactions.[14]

Nezhad *et al* conclude their paper by pointing out that Haly Abbas' "experience-based approach allowed him to describe the pulse, categorize it, and explain its value in differentiating various diseases."[15] Yet again we see here a sign of the influence that Rhazes, who we recall once said "experience is of more use than a physician," had over Haly Abbas and his practice of medicine.

Dying in 994 CE, Haly Abbas outlived by 12 years his patron, King 'Adud al-Dawla, who reigned from 949-982 CE. He left behind for us in *The Royal Book* not only his profound medical knowledge and findings, but also his wisdom, describing the kind of doctor all those wishing to practice medicine should strive to be and the kind of doctor Haly Abbas no doubt himself was:

A physician should try to treat his patient by food or medicine. The treatment of a patient should not be for the sake of raising money, and the medical action should not be for the sake of recompense and reward. The physician should never advise anybody to use dangerous and harmful medicine, and he should not even describe these kinds of drugs. He also should not guide and even talk concerning the mentioned medicine.

A physician should be merciful, chaste, kind, benevolent and well-spoken. The physician should try to cure all patients, the poor and indigent as well. He should not think of profit and reward from this group of helpless people at all; on the contrary, he should bring together their drugs from his own purse. If this is not possible, he should visit them at all hours, especially if the ailment is acute and fatal, because these kinds of diseases are changeable quickly.[16]

9. Avicenna

The Prince of Medicine

We now come to the most famous of all the great Arab physicians, Abū ʻAlī al-Husayn ʻAbd Allāh ibn Sina, known in the West as Avicenna. Avicenna (980 - 1037 CE) gained his place in history by excelling in and writing on virtually every area of knowledge, especially philosophy and medicine. Over 450 written works are credited to him, and nearly 160 of these works are still listed in library catalogs around the world. Muhamed Asimov calls Avicenna "one of the most extraordinary figures in world history"[1] and presents this thumbnail sketch of the man:

> A philosopher of encyclopedic knowledge, scientist and experimenter, eminent theorist of medicine as well as clinician and healer, poet and musician, he was also a Grand Vizier (prime minister), then a chain-fettered prisoner, and indefatigable traveler who visited many regions of central Asia and Persia, and the author of a vast corpus of writings covering almost every branch of contemporary knowledge.[2]

So impressive was Avicenna's grasp of all facets of knowledge that throughout the ages he has been bestowed many honorific titles: Prince of Medicine, Leader among Wise Men, Prince of Scholars, Chief of Physicians, Philosopher of Islam, and so on. But, Avicenna did not obtain his

intellectual powers by going easy on his studies as a youth. Instead, he pursued an intensive, almost non-stop regimen of self-education which also included at times one-to-one study under private tutors. This approach to learning rarely fails to yield dramatic results, and certainly did not fail in the case of Avicenna. This is most evident when we read the Prince of Medicine's own account of his early learning years:

My father was from Balkh (northern part of Afghanistan). During the reign of the Samanid ruler Nūh ibn Mansūr (977-997), he moved from Balkh to Bukhara where he worked as a functionary. He became the Governor of Kharmaithan, the center of a district in the region of Bukhara, an ancient metropolis. In the vicinity of Kharmaithan is a district called Afshana. He married my mother there and settled down. I, and later my brother, were born there. Later we all went to Bukhara and it was there that I began to study the Koran and *belles-lettres*. By the age of ten I had reached the end of the Koran and had read much *belles-lettres*, so that people were surprised.

My father was one of those who had responded to the invitation of the Egyptians and was counted among the Ismā'īlīs. He had accepted their opinions on the soul and on the intellect. My brother likewise. They often discussed these matters. I listened to them. I grasped what they were saying, and they tried to attract me to their rite. On occasion, too, they would discuss philosophy, geometry, and Indian arithmetic. Then my father decided to have me learn Indian arithmetic by sending me to a grocer who was in the habit of using that form of calculation.

Meanwhile, one Abu-Abdallah Nateli, who professed a knowledge of philosophy, came to Bukhara. My father invited him to stay with us in the hope that he would teach me. Before his arrival, I had visited Ismail Zahid, becoming an assiduous student of Muslim jurisprudence and one of his best pupils. I became familiar with the various methods of argumentation used by the professionals. Later, under Nateli's guidance, I began reading the *Eisagoge* (an introduction to the *Categoriae* of Aristotle by the third-century AD philosopher Porphyry). When he explained to me the definition of *genus*, I set about verifying the definition in a manner whose like he had never heard before, so deeply impressing him that he advised my father that I should not engage in any other occupation but learning. Whatever the problem my Master set for me, I succeeded in solving it better than he. I learned from him the rudiments of logic, a science with whose subtleties he had scant acquaintance. From then on I began to read books and study the commentaries on my own, so that I achieved mastery of logic. I also read Euclid's *Geometry*, under Nateli's guidance from the beginning to the fifth or sixth figure; as for the rest of the book, I managed to solve all the difficulties on my own, so that I achieved mastery of logic. Then I moved to (Ptolemy's) *Almagest*. When I had finished the preliminary work and came to the geometric figures, Nateli said to me, "Read it yourself and solve the difficulties; then explain to me what you have read to that I can distinguish for your benefit the true from the false." (The book was beyond the poor man's powers.) And so I began to elucidate it by myself, before expounding the questions to my Master. How many were the difficult problems Nateli had not solved until then and which he understood thanks to me!

Then Nateli left for Gorgan. As for me, I applied myself to reading and studying al-Farābī's *Fūsus al-Hikam* and other commentaries on physics and metaphysics. As each day went by, the doors of knowledge opened before me. Then I took up medicine and proceeded to read the works that had been written on that subject. Since medicine is not a difficult science, I soon excelled in it and skilled doctors studied it under my guidance. In addition, I cared for the sick practically. Thus, the doors of treatment based on experience opened before me, in a way that cannot be described. At the same time I kept up with my studies of religious law and disputation. By then I was sixteen years of age.

During the next year and a half I became increasingly immersed in my studies. I went over logic and all the problems of philosophy once again. At that period I did not sleep one night through, and worked all day, acquiring knowledge. I reduced every statement and proposition I came across into its syllogistic premises; then I examined the possible results of the premises and observed their conditions until the moment when the correct solution of the problem became indubitable. Whenever I was baffled by a problem or could not work out the middle term of the syllogism, I repaired to the mosque. I begged and prayed the creator of the universe to reveal to me what had been locked in obscurity and to make difficulties easy for

me. Then, at night, I would return home, set my lamp before me and begin again to read and write. Whenever sleep began to overcome me or I felt exhausted, I drank a frugal glass of wine and waited for my energy to return. Then I began to read again, and when I dozed off, I would see in a dream the very same question that I was pondering, so that the solutions to many problems appeared to me in my sleep. I continued unremittingly to follow this routine until I possessed a solid mastery of the sciences and held them in my grasp as far as our human faculties allow. Everything I learned at that time is not replaced by what I have learned more recently, even until today. Thus, I mastered logic, the natural sciences and mathematics.

Then I returned to the study of the divine science. I read (Aristotle's) *Metaphysics*, but without understanding a word of it. The author's intentions remained lost in obscurity to me. Although I read the book forty times from end to end until I knew it by heart, I could grasp neither its meaning nor its purpose. I despaired of understanding it by my own efforts and said to myself, "This book is incomprehensible." Then one day I was walking through the book bazaar when a bookseller proffered to me a book whose price he was shouting out. Discouraged as I was, I rebuffed him, convinced that there was nothing to be gained from this science. The vendor stood his ground and said: "Buy this book. It is cheap. I am selling it off for three dirhams because its owner is in needy circumstances." And so I bought it. The book turned out to be Abu Nasr al-Farābī's *Commentaries on the Metaphysics*. I rushed home and read it. The whole purport of Aristotle's treatise straightaway became clear to me because I already knew the work by heart. In a transport of delight, I began the following day to distribute alms to the poor as a thanksgiving.

At this time the Emir Nūh ibn Mansūr, the prince of Bukhara, was afflicted with a serious illness which the doctors were unable to cure. I was renowned among these physicians for the range of my studies. They suggested to the prince that he should summon me. So off I went and joined the other physicians who were treating him. And I distinguished myself in his service.

One day I asked him to grant me access to his library, to examine the books there and to read the medical works. He agreed to my request. I made my way into a mansion with many chambers, with chest upon chest of books in each. Each room was devoted to a single subject, one room containing works of literature and poetry, another works of jurisprudence. I perused the catalogue of books of the Ancients and asked for all those I needed. Among them I saw books whose very names were unknown to many—works which I had never seen before and have not seen since.

I read these books, profiting from them and acquainting myself with each author's rank in his own field of knowledge. At the age of eighteen, I had finished studying all these sciences. At the period my knowledge was due above all to my memory; today I am more mature, otherwise my knowledge is exactly the same and nothing has changed.[3]

By this account we learn that Avicenna had mastered medicine by the age of 16, an amazing feat for one so young. Avicenna, however, did not think this accomplishment so amazing because, as we just read, it was his opinion that "medicine is not a difficult science." That the practice of medicine proved easy for Avicenna there can be no doubt; as a 17-year-old, he restored to health the seriously ill ruler of Bukhara. As partial compensation for his valuable service to the Emir, Avicenna gained access to the magnificent royal library and proceeded to read all of the works by the Ancients (the Greek and Roman authors) he had not already come to know. A short time later the "Sanctuary of Wisdom" (as the Emir's library was known) burned down. According to Afnan, "Avicenna's enemies—and he never lacked them—hastened to accuse him of firing the library; 'so that he could attribute the contents of those books to himself,' they claimed."[4] Most people, though, did not share this suspicion. Instead, they "consoled themselves by saying: 'The Sanctuary of Wisdom had not perished. It has been transferred into the brain of al-Shayk al-Ra'is (Prince of Medicine, i.e., Avicenna)!'"[5]

When Avicenna was in his early-20s, his life changed dramatically. "My father died and my circumstances changed completely," he informs us. "I accepted a post in the Sultan's employment and had to move to Gurganj."[6] We do not know exactly why Avicenna was compelled to switch his allegiance to a different ruler. Afnan speculates that it was because the rigidly orthodox "Turks were gaining ascendancy (in Bukhara) and they must have frowned on the son of an Isma'ili… Avicenna might therefore have become unwelcome for both racial and religious reasons."[7]

The Prince of Medicine was to be hounded and threatened over his alleged atheistic and unorthodox beliefs the rest of his life; as a result, he often had to flee from one city to another. Although Avicenna was favorably received in Gurganj by the vizier to the Prince of Khorezm, he eventually abandoned the city. One story has it that he departed because the powerful Sultan Mahmud of Ghazna demanded from the Prince of Khorezm Avicenna's services—a request the prince was in no position to deny. Sultan Mahmud was notorious for his "strict orthodoxy and ruthless treatment of the unorthodox."[8] Avicenna therefore decided to take his chances on flight rather than serving the Sultan. This probably proved to be a good decision because Mahmud, upon learning that Avicenna had fled, became furious and had his officers circulate 40 copies of Avicenna's picture "throughout the land with strict orders that he should be arrested wherever found and sent to the Sultan under escort."[9] Avicenna, unfortunately, provides us little insight into the veracity of this story. He relates, "Again, constrained by necessity, I moved from Khorezm to the confines of Khorasan, passing through Baward, thence to Tus, then Shaqqan, then Samanqan, then Jajarm and thence to Jurjan. My entire purpose was to reach the Emir Qābūs; but it happened at the moment that Qābūs was taken and imprisoned in a fortress, where he died. After this I went to Dihistan where I fell very ill, then returned to Jurjan where Abū 'Ubayd al-Jūzjānī made friends with me; and I composed a poem on my condition in which there is a verse saying:

And great once I became, no more would
city hold me,
And when my value rose, no one would
care to buy me.[10]

Mentioned in Avicenna's account of his journey is a person named Jūzjānī. Jūzjānī, a young Persian physician, became the Prince of Medicine's lifelong companion, pupil and scribe, and exerted a positive influence on his "Master" (as he respectfully referred to Avicenna). While the two stayed in Jurjan, Avicenna began writing his most famous medical work, *The Canon of Medicine*. The book was not to be finished there. For obscure reasons, Avicenna and Jūzjānī moved on to Rayy, the native city of Rhazes located near Teheran in present-day Iran. While there Avicenna came under the employment of the prince, Majd al-Dowleh. The prince, Jūzjānī notes, "was overcome by melancholia and the Master applied himself to treating him."[11]

It must be pointed out that Avicenna possessed other attributes besides high intelligence that worked to his advantage whenever he wished to attain the position of court physician to any ruler he met. One factor was his personal appearance. He is said to have been blessed with "strikingly good looks and impressive figure."[12] His final patron, Ala el-Dowleh, the Amir of Isfahan, was enraptured by his presence. One story has it that Avicenna "used to sit very close to the Amir, whose face became radiant with delight as he marveled at his good looks, and

accomplishment and wit. And when he spoke all those present listened attentively, none uttering a word."[13]

Avicenna often sought the position of court physician because it paid well and provided him freedom to continue his intellectual pursuits; he was, of course, preeminently qualified for the job, and seems to have had little trouble securing such employment wherever he lived. Avicenna's reputation was that of a philosopher-scientist, or *hakim*—he was not just a doctor—and this virtually ensured that he would be a welcome addition to the ruler's court. Nasr explains the role the *hakim* played in Islamic society:

> The wise man or *hakim*, who has been throughout Islam's history the central figure in the propagation and transmission of the sciences, has usually also been a physician. The relationship between the two is in fact so close that both the sage and the physician are called *hakim*; many of the best-known philosophers and scientists in Islam, such as Avicenna and Averroes, were also physicians, and made their livelihood through the practice of the medical art. . .
>
> This close relationship between the philosopher-sage and the physician had much influence upon the position which the practitioner of the medical art occupied in Islamic society, and the conception that the community had of him. The physician was in general expected to be a man of virtuous character, who combined scientific acumen with moral qualities, and whose intellectual power was never divorced from deep religious faith and reliance upon God.[14]

After staying in Rayy for a couple of years "circumstance conspired to oblige" Avicenna and Jūzjānī to again depart. This time they settled 250 miles to the west in Hamadān, a city located 220 miles southwest of Teheran. While in Hamadān one of Avicenna's closest calls with death occurred. Afnan relates the sequence of events:

> He (Avicenna) decides to take an openly active part in local politics; and places himself at the disposal of another influential lady, who may have been the wife or the favorite of Shams el-Dowleh, "in order to investigate her finances." By this means he becomes acquainted with the ruler and is summoned to court to treat him for an attack of colic. The treatment proves successful and he departs "loaded with many costly robes… having passed forty days and nights at the palace and become one of the Amir's intimates." In a war against the Kurds, he accompanies the prince as his personal physician; and although the expedition proves a failure, he succeeds in winning the favor of the Amir, and on their return to Hamadān is appointed a vizier with all the powers of the office. His debut as a political figure and State administrator, however, was followed by further trouble. The army for some reason refused to have him, "fearing for themselves on his account," whatever that statement means. They could not in any way be pacified and "they surrounded his house, haled him off to prison, pillaged his belongings… They even demanded that he should be put to death; but this the Amir refused, though he was agreeable to banishing him from the State, being anxious to conciliate them." The fury of the army was such that Avicenna had to go into hiding for forty days in the house of a friend. However, Shams el-Dowleh was again attacked by colic and he was again sent for. When he appeared at court, the Amir apologized profusely for what had occurred. For a second time and with great ceremony Avicenna was appointed vizier.[15]

This episode seems to have had a decided effect on Jūzjānī, who realized that Avicenna's knowledge and ideas would die with the man if not written down; his master's narrow escape therefore afforded an opportunity that was too important to pass up. Afnan continues:

> At this juncture, Jūzjānī suggested that he should not neglect his writing, and urged him to undertake a commentary on the works of Aristotle. The reply is revealing with regard to Avicenna's attitude and outlook. He said he had not much time at his disposal, but "if you agree that I should compose a book setting forth those parts of the sciences that I believe to be sound, not disputing therein with any opponents nor troubling to reply to their arguments, I will do so." He then began work on the physical section of the

Kitāb al-Shifā' ("The Book of Healing") which is the longest of his extant works. He had already started on his *Qānūn* (Canon) of medicine, and here he finished his first book. Every night he held a circle of study at his home for his pupils. "I would read the *Shifā'*," Jūzjānī says, "and another in turn the *Qānūn*. When we had each finished our allotted portion, musicians of all sorts would be called in and cups brought out for drinking, and in this manner we spent the rest of the time. Studying was done at night because during the day attendance upon the Amir left him no spare time."[16]

We have already reported that Avicenna's enemies accused him of being an atheist and heretic. They often cited his personal conduct, such as his drinking of wine, as proof that he was not a truly religious man. The famous theologian al-Ghazālī (1058-1111 CE), called by many "the greatest Muslim after Muhammad,"[17] was one such critic of Avicenna. In his autobiographical work, *Deliverance from Error*, he presents the case against Avicenna and the philosophers in general:

A fifth man says: "I do not perform these acts (of worship) out of obedience to authority. I have studied philosophy and I know that prophecy actually exists and that its achievement is wise and beneficial. I see that the acts of worship it prescribes aim at keeping order among the common people and restraining them from fighting and quarreling with one another and from giving rein to their desires. But I am not one of the ignorant common people that I should not enter within the narrow confines of duty. On the contrary I am one of the wise, I follow wisdom, and thereby see clearly for myself so that I do not require to follow authority."

This is the final word of the faith of those who study the system of the theistic philosophers, as you may learn from the works of Ibn Sina (Avicenna) and Abu Nasr al-Farābī.

These are the people who show politeness to Islam. Often you see one of them reading and Qur'an, attending Friday assembly and public Worship and praising the sacred Law. Nevertheless, he does not refrain from drinking wine and from various wicked and immoral practices! If someone says to him, "If the prophetic revelation is not genuine, why do you join in the prayers?" perhaps he will reply, "To exercise my body, and because it is a custom of the place, and to keep my wealth and family." Or perhaps he says, "The sacred Law is genuine; the prophetic revelation is true;" then he is asked, "And why then do you drink wine?" and he replies, "Wine is forbidden only because it leads to enmity and hatred; I am sufficiently wise to guard against that, and so I take wine to make my mind more lively." Ibn Sina actually writes in his *Testament* that he swore to God that he would do various things, and in particular that he would praise what the sacred Law prescribed, that he would not be lax in taking part in the public worship of God, and that he would not drink for pleasure but only as a tonic or medicine. Thus, the net result of his purity of faith and observance of the obligations of worship was that he made an exception of drinking wine for medical purposes!

Such is the faith of those philosophers who profess religious faith. Many have been deceived by them. . .[18]

According to Afnan, Avicenna "did not hesitate to display publicly his love of music and wine;"[19] in fact, "throughout his life he appeared to find satisfaction in completely disregarding what the public thought and said of him."[20] Afnan notes that Avicenna also "indulged in sexual relations far more than even his strong physique could stand. We are told that even in failing health he did not abstain; and on top of his political activities and intellectual pursuits this proved extremely exhausting. When reproached for intensive living, he gave his famous reply that he wanted his years in breadth and not in length."[21] By not keeping more private the lifestyle he preferred and led, it can be said that the Prince of Medicine invited criticism; for living the way he did could only arouse the jealousy and hatred of his enemies, especially the arch religionists.

Another charge some theologians have made against Avicenna is that he engaged in politics and actively associated himself with various rulers. In al-Ghazālī's opinion, frequenting the company of rulers is bad "because you get nothing of their wealth without their robbing you of something better of your religion."[22] Al-Ghazālī relates this story in support of his point:

> Al-Hasan said, "There lived before your time a man who had embraced Islam at a very early date and who had enjoyed the company of the Apostle. He did not frequent the company of governors; on the contrary he avoided them altogether. And so one day his sons pointed out to him that men whose Islam was not as old as his and who, unlike himself, did not enjoy the company of the Prophet, frequent the company of governors, and asked him why he did not do the same. He replied and said, 'O my sons! Shall I go and stand by a stinking corpse surrounded by men? By God! If I can help it, I shall never join them.' Then his sons said, 'We shall then die of starvation, father.' To which he replied, 'I would rather starve to death as a believer than die as a fat hypocrite.'" Al-Hasan then remarked, "By God, he beat them, because he had realized that beneath the sod, the flesh and the fat of the man rather than his beliefs decay.[23]

Avicenna's religious stance is best revealed in his philosophical works, the most famous and comprehensive being his *Kitāb al-Shifā'*; in it he "sought to achieve a synthesis between philosophy and mysticism, rationalism and spiritualism."[24] Reza Davari, in his 1980 *Unesco Courier* article, "A Philosopher Under Fire," informs us that "Avicenna used philosophy to interpret certain verses of the Koran" and feels that his "ideas were in line with religious thought." [25] For example, whenever Avicenna "finds himself unable to expound a religious topic, he admits his own imperfection and falls back on interpretation of the Koran or the Prophet. Since he is incapable of explaining the resurrection of the body, he maintains that he follows the Prophet in this matter."[26]

Despite all the objections of his critics, Avicenna succeeded in legitimizing Greek philosophy, particularly Aristotelian thought, to the Islamic world. Asimov remarks that Avicenna "threw new light on Aristotle's logic by considerably modifying the problems connected with the Aristotelian syllogisms based on categorical judgements as well as syllogisms based on hypothetical and conventional judgements."[27] This achievement did not please certain backward-looking religious scholars, who asked, "Greek philosophy. . . but for how long?"[28] Nonetheless, as Devari points out, "what some consider a heresy, and others a mixture of Greek ideals and the fundamentals of religion, forms the very essence of Islamic philosophy."[29]

The Amir of Hamadān, to whom Avicenna served as Vizier, had already been restored to health twice by the Prince of Medicine. Unfortunately, the Amir did not learn from these experiences. Perhaps, like many people, he could not imagine himself dying; he certainly must have overestimated his own physical condition. Whatever the case, when his health broke down a third time, the Amir rejected the treatment proposed by Avicenna and blindly plunged ahead; the disastrous consequences of pushing the body past its limits and not sticking with a winner (the sound advice of Avicenna) soon manifested themselves. Afnan relates what happened:

> The restless Amir decided to go to war again and took Avicenna along with him. A severe attack of colic seized the prince during what proved to be an exhausting campaign, and he refused to follow the directions of his watchful physician and take sufficient rest during the intervals of fighting. The army, apprehensive and fearing the consequences of his death, decided to convey him to Hamadān, but he died on the way.[30]

The death of the Amir left Avicenna unprotected from the Army, with which he had never been on good terms. He therefore went into hiding during which Jūzjānī "urged him to profit from

this enforced leisure and finish writing the *Shifā'*."[31] Again, Jūzjānī sensed how important it was for his master to put his knowledge down in writing, and to make every moment count. Events were to verify the wisdom of Jūzjānī's recommendation. Avicenna complied, and how he went about this task illustrates the man's enormous intellect, powers of organization, memory, and industriousness. Jūzjānī recalls that Avicenna "asked for paper and ink; these being brought, the Master wrote in about twenty parts of eight sheets each the main topics that he wanted to discuss, in his own hand, and continued writing for two days until he had enlarged on all the topics without once asking for any book or reference to any text, accomplishing the work entirely from memory. Then he placed these parts before him, took paper, and pondering on every question, wrote his comments on it. Each day he wrote fifty leaves until he had completed the whole of the natural sciences and metaphysics, with the exception of the books on animals and plants. He also began with logic and wrote one part of it."[32] Eventually, Avicenna was discovered and thrown into prison; but, four months later he was liberated after Ala el-Dowleh, the ruler of Isfahan, conquered Hamadān. Avicenna, as you might guess, moved to Isfahan and served in the court of Ala el-Dowleh.

Avicenna's years in Isfahan, we are told, "were indeed the best years of his life."[33] He did not hold any official position, "and avoiding politics and its pitfalls, he devoted his entire time to writing."[34] Avicenna therefore was able to complete the *Shifā'* and several other works. It was probably during this period that the other books comprising the *Canon of Medicine* (Books II-V) were written. Campbell provides us this description of the *Canon's* contents and its highly influential impact on the development of the field of medicine in Western Europe:

> The *Canon* contains about a million words and is divided into major and minor sections; the whole is divided into five books, the first two of which deal with physiology and hygiene, based on the writings of Aristotle and Galen; the third and fourth deal with treatment, and the fifth is on materia medica. This work was the final codification of all Greco-Arabic Medicine, and formed half the medical curriculum of European universities in the latter part of the 15th Century, and continued as a textbook up to about 1650 in the Universities of Montpellier and Louvain."[35]

Nasr expands on Campbell's description of the *Canon* by pointing out that it "is certainly the most widely read and influential work of Islamic medicine," and adds that its five books' subjects are "general principles, simple drugs, diseases of particular organs, local diseases that have a tendency to spread over the body, such as fever, and compound drugs. In these books, Avicenna summarized medical theory and practice in such a fashion that the *Canon* became once and for all *the* authoritative source of Islamic medicine."[36] Hakim Mohammed Said, in his 1980 *Unesco Courier* article on the *Canon*, provides the following important fact about Avicenna's masterpiece not mentioned by Nasr or Campbell: "Translated into Latin a century after its appearance by the famous Italian translator Gerard of Cremona, it gained such popularity that in the last thirty years of the fifteenth century it was issued sixteen times. It was still being printed and read in the second half of the seventeenth century and was consulted by medical practitioners regularly."[37] That the *Canon* proved popular with physicians is further evidenced by such comments as those made by Nizāmī-i 'Arūdī, author of the *Four Discourses* (which deals with scientific activities in medieval Islam), who lived in the 12th Century CE. 'Arūdī offers this ringing praise for the *Canon*:

> The Lord of the two worlds and the Guide of the two Grosser Races says: "Every kind of game is in the belly of the wild ass": all this of which I have spoken is to be found in the *Qānūn*, with much in addition thereto; and whoever has mastered the first volume of the *Qānūn*, to him nothing will be hidden

of the general fundamental principles of Medicine, for could Hippocrates and Galen return to life, it were meet that they should do reverence to this book.[38]

During this period in Avicenna's life when he was writing the *Canon* and other works, he also met every Friday, along with other men of learning, with Ala el-Dowleh to discuss scientific and philosophical matters. At these sessions the Prince of Medicine "proved himself quite supreme and unrivalled in every branch of learning."[39] The Amir valued Avicenna's genius so much that on one occasion he requested him to compile new astronomical tables, to replace the unreliable ones then in existence. Abid Sadykov, in his 1980 *Unesco Courier* article, "A Forerunner of Modern Medicine," tells us the outcome of this project:

> Avicenna built an observatory and, using instruments he himself invented, made continuous observations of the luminaries over a period of several years. The result was his ephemerides, or tables showing the daily positions of the planets in relation to the ecliptic. His calculations have proved more accurate than those of the Ancients. He was among the first medieval astronomers to prove that the sun's apogee is not fixed. He invented a special instrument combining several large rulers set in elevation, which he used to determine the altitude and azimuth of the luminary. To refine his measurements, he used an original method which subsequently became known as Nonius' method, after the Portuguese scholar Pedro Nunhes, or Nonius, who rediscovered this method in the sixteenth century.[40]

This story again demonstrates that Avicenna's intellectual prowess did not rest solely in the fields of medicine and philosophy. He also made valuable contributions to geometry, minerology, geology, engineering, physics, among other scientific disciplines.

Before reviewing the final phase of Avicenna's life, let us study his splendid medical work, *The Canon of Medicine*. Just as Avicenna synthesized diverse schools of thought, such as rationalism and spiritualism, in his philosophical works, so too in the *Canon* did he show interrelationships between the different factors influencing health (such factors as diet, sleep, exercise, etc.). The resulting merger of these different factors into a total health care program typifies the Preventive Medicine approach, an approach that characterizes the medical practice of the medieval Arab physicians. The importance of the *Canon* is that it served to legitimize this approach to health care, with its cogent and intelligent presentation of theory and facts. This helps account for the *Canon's* popularity, which was to last for centuries. By studying the *Canon*, we shall see better those Preventive Medicine principles that worked so well in the past, and also whether Avicenna followed his own wise counsel.

Let us now look at the medical theory and practice advocated by Avicenna in the *Canon* and which gained so many adherents. For starters, Hakim Said notes that "the basic thesis with Avicenna is that the whole is greater than the sum of its parts, and that man is a dynamic organism, with each individual having his own unique temperament."[41] Avicenna's "concept of causation," continues Said, "implies that the internal organs belong to each other beyond the anatomical limits. Anatomy regards the heart as a circumscribed organ while for Avicenna it is the part of force occupying the whole of the body."[42] In other words, man is like a living jigsaw puzzle, who will function optimally so long as each piece is properly in place; a missing piece or misplaced piece will throw off and adversely affect the entire unity. To Avicenna many factors could influence the coherence of the unity and possibly dislodge pieces from their proper location. Realizing this, he contended that a holistically-inclined constitutional approach to health would 1) best explain disease, and 2) lead to the selection of the most suitable remedy. According to Said, the physician using such a constitutional approach needs to be aware of "the individual's genetic structure; the

kind of temperament, structure, and strength of the faculties possessed by him; environmental factors; and Nature's own effort at the restoration of maintenance of his life-functioning."[43] O. Cameron Gruner, who translated Book I of the *Canon of Medicine* into English, feels that this is not asking too much of the physician. In a concluding survey to his translation, Gruner discusses the main difference between Western medical practice, which assumes a kind of least common denominator approach, and the individual-based medical practice of Avicenna; it is clear he believes Avicenna's orientation has more to offer. Comments Gruner:

The ancient medicine was concerned essentially with the given *patient now before us*; whereas now it is simply the science of diseases which it is our duty to diagnose accurately, prevent if possible, and treat on lines capable of wholesale application. To Avicenna, the determination of the constitution of the patient was of the very first importance, for on it depended the character, course, and duration of his illness, and upon that again depended the choice of remedies.

After all, from the patient's point of view, the real object of consulting a medical man is to be restored to a state of well-being. It is little comfort to be (virtually) told that 85-90 percent of cases of his complaint are cured by the treatment adopted in his case, only to find that he proves to be one of the remaining 10-15 percent for whom there is little or nothing to be done. True, his sighs are drowned in the shouts of the fortunate, and fail to reach the clinical laboratory, surgical wards, consulting room, or research councils.[44]

So much for all this background information. Let us proceed to investigate Avicenna's own words and specific advice, which now should appear more understandable. In the *Canon* Avicenna states that "the art of maintaining health is not the art of averting death, or of avoiding extraneous injuries, or of securing the utmost longevity possible to the human being. It is concerned with two other things: 1) the prevention of putrefactive breakdown; 2) the safeguarding of innate moisture from too rapid dissipation, and maintaining it at such a degree of strength that the original type of constitution peculiar to the person shall not change even up to the very last moment of life."[45] He continues by saying that maintaining health "is secured by a suitable regimen," one which "safeguards the body from the development of putrefactive processes within it."[46] When Avicenna warns about putrefactive processes developing within the body, he is talking about self-poisoning or auto-toxemia. The critical bearing auto-toxemia has on disease formation is evidenced somewhat by how frequently the phrase "Death begins in the colon" is encountered in health books nowadays. More importantly, it is evidenced by the fact that nearly every disease affecting mankind can be traced to auto-toxemia; of course, it is the person's faulty diet, poor health habits, and unwholesome lifestyle which are the primary underlying causes of the physical breakdown, and it is these which need corrections if good health is to be enjoyed.

Herbert Shelton, the great 20th Century leader of the Natural Hygiene movement placed as much importance on the prevention of putrefaction within the body as did Avicenna. Natural Hygiene, incidentally, refers to the practice of living in harmony with nature by consuming a balanced natural food diet, fasting when sick and maintaining a healthy lifestyle. Here is what Shelton says happens when our choice of foods is unwise:

IF WE DO NOT EAT PROPER FOODS PROPERLY COMBINED, OUR STOMACHS BECOME BATTLEGROUNDS! Instead of being digested and assimilated, what we have eaten becomes a fermenting and putrefying mess that gives us misery.

Bacteria convert starches and sugars into vinegars, alcohols and acetic acids, thoroughly unwelcome substances in the human system. They especially affect nerve cells and a single bout with fermentative indigestion can be responsible for the loss of hundreds of thousands of brain and nerve cells.

In time we become a "nervous" wreck to which improperly combined sugars and starches have been heavily contributory.

Protein matters putrefy, being converted into foul smelling gases, indols, skatols and other matters poisonous to the body. All poisons from fermented and rotted foods make our intestinal tracts seething cesspools. They so foul up the vagus nerves that the body cannot discharge its functions. A sewer line of foul substances not only causes great distress but saps our bodies of vital energies. Peristaltic nerves suffer paralysis and our whole system becomes constipated and stagnant—not merely the bowels but the whole system![47]

The short-term consequences of auto-toxemia are certainly no fun—the indigestion, heartburn, listlessness, etc. As bad as these conditions are, they are definitely preferable to the consequences one could easily experience if one persists in improper eating habits over the long term, ignoring the short-term warning signals. Shelton explains:

Failure to correct food combinations will permit the thickening of the walls of the stomach and soreness will finally develop into ulceration. This will probably be cared for through operative methods which will be followed by adhesions and more ulcers if the causes are continued. Another operation will again remove the ulcers, if a hemorrhage has not by this time removed the patient. Cancer is the next step and after cancer the kindness of death.[48]

Shelton maintains that the ideal meal, one which will *not* result in putrefaction and fermentation, is the mono meal—that is, **one food at a meal is the ideal**. If, out of boredom, the person desires more than one food, Shelton advises that the items constitute a good food combination; this will forestall indigestion and auto-toxemia. However, if the person does not adhere to eating proper foods properly combined—for example, if the person eats starches with protein (mashed potatoes with chicken, etc.)—then the old battle inside the body resumes and bad health consequences lurk around the corner. Says Shelton, "Every transgression you visit upon your body exacts its toll such that you suffer to some measure, whether you are aware of it or not."[49] Interestingly, Avicenna issued a warning along these lines. He states, "Persons who are able to digest 'bad' foods should not be deceived, because (for all they know) they will some day give rise to bad humours and consequent obstinate ailments."[50]

Avicenna's and Shelton's warnings, both virtually identical and made nearly 1,000 years apart, show us how little that mankind has learned over the centuries about proper diet is new. But, some progress is being made. For example, although Avicenna was interested in preventing putrefaction processes from occurring within the body, he was not 100% accurate in describing what exactly constitutes a good, fair, or poor food combination; he seems to have not had as much understanding about the subject as today's Natural Hygienists. This is revealed by examining the Prince of Medicine's ideal meal. It incorporated proteins, starches, and "sweets" (either fruit or some sort of dessert)—a poor food combination which leads to incomplete digestion (putrefaction and fermentation), indigestion, and associated auto-toxemic conditions. According to Avicenna, "the meal should include: (1) flesh, especially kid of goats, veal, and year-old lamb; (2) wheat, which is cleaned of extraneous matter and gathered during a healthy harvest without ever having been exposed to injurious influences; (3) sweets of appropriate temperament; (4) fragrant wine of good quality."[51]

Two items in particular comprising Avicenna's ideal meal are not wholesome foods: the wine and meat. The alcohol in wine is toxic to all tissues of the body; plus, it enhances bacterial

activity and contributes significantly to gastrointestinal fermentation and putrefaction. Further, the World Cancer Research Fund (WCRF) on October 18, 2022 issued its new policy on alcohol consumption. Titled "Alcohol and Cancer: Our New Global Policy Priority, WCRF stated: "At World Cancer Research Fund International, **we have a clear recommendation around cancer and alcohol, given its links with 7 types of cancer—limit alcohol consumption and, for cancer prevention, it's best not to drink alcohol."**[52] Meanwhile, cooked meat is one of the most difficult foods for the body to digest, due mainly to its high content of interlaced protein and fat (which are incompatible substances to begin with and are slowly digested even if eaten alone). Admittedly, Avicenna promoted lean meat, which would have a lower fat content and therefore be less indigestible; however, this adjustment does not correct the problem resulting from the cooking process. The cooking process changes the minerals in meat into inorganic minerals, which the body cannot assimilate and so must expel. Also, overcooked meat, especially the burnt charcoal-like portions, is rendered into a carcinogen (cancer-causing agent). As reported by *The Indian Express* in its November 10, 2022 article, "Overcooked Meat Doubles Cancer Risk: Study," scientists at the Norwegian Institute of Public Health conducted a study involving human-like mice, and "found that the dark crust formed on the outside of a well-done steak or joint of red meat more than doubles the risk of intestinal cancer."[53] Other bad qualities about wine and meat could be mentioned, but it is sufficient to realize that consuming either one robs the body of valuable energy.

While it can be said that an advance in knowledge in the area of food combining has occurred since Avicenna's time, the advance cannot be called huge, for the Prince of Medicine saw that piling on one meal on top of another was detrimental to the body. He observes, "A person… should not partake of food until there is a definite appetite, and unless the stomach and upper small intestine have emptied themselves of the previous meal. For there is nothing more harmful to the body than to superpose aliment upon incompletely digested food."[54] More importantly, Avicenna warns against eating several courses *during a meal*—the several courses necessarily implying different food groups—and indirectly supports the concept of the mono meal. He comments, "To have several courses to a meal is injurious in two directions: (a) the rate of digestion is diverse, for the part that digests more speedily is admixed with a part which is not yet digested; (b) a person may eat too much of one dish. Already in ancient times, too, persons who had been exercising themselves avoided this error, being satisfied to partake of meat alone in the morning, and bread alone at supper-time."[55] This observation by Avicenna seems to contradict his description of the ideal meal, which, while it does not contain several courses, does consist of incompatible food groups, though the former may result in less harm and suffering than the latter. By contrast, the mono meal Avicenna indirectly praises will not harm the body (unless the single food itself is bad, such as junk food). Avicenna's position on what type of meal is best—mono meal or his "ideal meal"—remains unclear. Yet, the fact that he even mentions mono meals and the disadvantages of eating several courses at a meal shows that his understanding of food combinations was not vastly inferior to that which is understood by today's Natural Hygienists.

Certainly, advocacy of mono meals cannot be considered a new idea, for Avicenna, as we saw above, refers to persons living in "ancient times" who followed the mono meal routine. It is not unreasonable therefore to say that mankind has probably known about the benefits of the mono meal for thousands of years; Natural Hygienists have simply rediscovered and expanded on old knowledge.

Another passage in the *Canon* throws light on Avicenna's level of understanding about what comprises a proper food combination. "Some people," the Prince of Medicine notes, "consider that grapes are good to take after roasted meats; but the contrary is really the case; they are very bad indeed. So too, is a dish combining dates, figs, and the like. But (dry) pomegranate seeds are good."[56] Grapes are a sub-acid fruit, while dates and figs are sweet fruits. (Every fruit belongs to one of three distinct food groups: acid fruit, sub-acid fruit, or sweet fruit.) The sub-acid and sweet food groups (as well as the acid fruits) combine poorly with the protein food group, of which roasted meats belong. Shelton explains what happens when fruit is eaten with protein: "The acids of acid foods inhibit the secretion of the digestive acids required for protein digestion. Undigested protein putrefies in bacterial decomposition and produces some potent poisons… Eat sugars (fruits) and protein at separate meals. Fruits undergo no digestion in the stomach and are held up if eaten with foods that require digestion in the stomach."[57] Shelton adds that the fruits will ferment while waiting their turn to be digested. The pomegranate seeds that Avicenna says are all right to eat with roasted meat contain, like most seeds and nuts, a good amount of protein (1.5 grams per half-cup of pomegranate seeds); they therefore should not require any substantially different digestive acids from those used on the meat, and so would likely not paralyze the digestive process. Shelton, however, being a very strict Natural Hygienist, even advises against eating two different protein foods at the same meal, and one can see why following this advice would be beneficial, even if sometimes quite inconvenient. Still, if two foods are to be eaten at a meal, they should, if possible, belong to the same food group or to similar food groups (such as an acid fruit with a sub-acid fruit). To this extent then we can say that Avicenna was right in allowing pomegranate seeds to be eaten with roasted meats, and very right in counseling against eating fruits with meat. If this instance is representative of Avicenna's knowledge about food combinations, then it can be said that he knew this subject fairly well.

Throughout the *Canon* the Prince of Medicine argues in favor of moderation, particularly in eating habits; his stance is akin to that of Rhazes who contended that one should eat in order to live, not live in order to eat. States Avicenna, "No meal should be bulky enough to completely satisfy the appetite. One should rise from the table while some appetite or desire for food is still present. For such remnants of hunger will disappear in the course of an hour… A meal is injurious when it brings heaviness to the stomach, and wine is injurious when it exceeds moderation and swims in the stomach."[58] Knowing that few people possess the willpower to follow this advice 100% of the time, especially during holidays when feasts abound, the Prince of Medicine recommended that "if one ate to excess one day, one should fast the next."[59] By doing this, the body would have a chance to rest and repair the damage which had occurred from the overeating. As Dr. Alan Immerman notes in his paper, "Toxemia Explained—Scientifically," (published in *Health Science*, Vol. 4, No. 1, 1981) fasting "gives the body a chance to dispose of toxic buildup which results from the common practice of overeating and eating the wrong foods."[60]

Modern scientific research confirms the wisdom of Avicenna's advocacy of fasting. Shelton, for example, in his monumental book, *Fasting for Renewal of Life*, remarks that "in a fast, the body tears down its defective parts and then builds anew when eating is resumed."[61] He goes one to discuss the path-breaking experiment conducted by Dr. Alexis Carrel of the Rockefeller Institute, which showed how the body rapidly ages when it is not allowed to rest:

In line with the Hygienic theory of causation, Carrel pointed out that the waste excreted by living cells, if not removed regularly from the culture medium, result, not alone in ageing of the cells, but also in

their death. The cells become poisoned by the accumulation of their own waste—a genuine autointoxication or, as we designate it, Toxemia. The cells of the body, struggling for years with retained and accumulated waste, lose something that we have no means of restoring. Changes take place in the tissues that are irreversible. Ageing is permanent.[62]

Although Avicenna included wine in his ideal meal, it is clear that he favored only small amounts of any type of liquid being consumed around mealtime. He states: "Nor should much water be drunk after a meal, for it causes the food to leave the coats of the stomach and float about. One should wait, and not drink fluids until the food has left the stomach—which is evidenced by the sensation of lightness in the upper part of the abdomen. …To sum up—if a person must drink, it is better only to take so small an amount, at the end of the meal (not during the meal), as will spread over and moisten the food, and therefore not be injurious."[63] Avicenna's insights on this subject hardly differ from those of the Natural Hygienists. The Shangi-La Natural Hygiene Institute says this about drinking liquids during a meal:

While eating, large quantities of digestive juices are being poured into the stomach. If drink—water or beverages—is taken, these are diluted. The water passes out of the stomach in ten to fifteen minutes and carries the digestive juices along with it. The food is deprived of these juices and digestion is greatly retarded or stopped altogether. In addition, drinking water and beverages leads to bolting of food. The food is washed down instead of being properly masticated and insalivated. Fermentation, putrefaction, and indigestion will follow. For these and other reasons we therefore recommend that you drink your water:

At least fifteen minutes before meals.
Wait at least thirty minutes after a fruit meal.
Wait at least two hours after a starch meal.
Wait at least four hours after a protein meal.[64]

Regrettably, few contemporary Western or Eastern allopathic doctors, despite undergoing schooling and training costing tens, if not hundreds, of thousands of dollars, are aware of such basic Preventive Medicine principles as correct food combining and proper timing for drinking liquids. This is why we have not noted many similarities between Avicenna's counsel and that of present-day allopathic doctors, as few such similarities exist. Instead, we have had to keep using as a reference the positions of the Natural Hygienists, who most closely resemble in their outlook on health and life the Arab and Arabized physicians of Avicenna's era. Also, it becomes apparent while reading the *Canon* that the Prince of Medicine is constantly saying with respect to one's health, "You should **not** do such and such; instead, do this." A characteristic of Preventive Medicine is to advise the person what he or she should *not* do, so as to prevent harm or further suffering, the underlying philosophy being "an ounce of prevention is worth a pound of cure." Avicenna most certainly belongs to this school of medicine.

We have already observed the statement of Hakim Said that Avicenna regarded man as "a dynamic organism, with each individual having his own unique temperament," and the comment by Gruner that the school of medicine to which Avicenna belonged "was concerned essentially with the given *patient now before us*." The *Canon* is one large testament to Avicenna's belief that each case is a different case, and therefore the most productive practice of medicine is that which is oriented and customized to the individual. One section in the *Canon* which exemplifies this viewpoint is titled "Idiosyncrasies." In "Idiosyncrasies" Avicenna tells us this:

Some persons have an idiosyncrasy of the stomach in which the foods leave it very rapidly, and do not stay in it long enough to undergo gastric digestion. This explains the necessity for taking the

idiosyncrasy of the stomach and its temperament into consideration (along with other factors when drawing up a dietary).

There are some persons in whom tenuous food, instead of being digested quickly as it should, undergoes decomposition in the stomach, whereas less rapidly digestible foods are digested more readily. The stomach of such a person is designated igneous. But other persons are exactly the opposite. Therefore, the rules to be given must be adapted to the peculiarity of each patient.[65]

The balance of "Idiosyncrasies," as throughout the *Canon*, further concerns itself with what is appropriate for the individual.

What Avicenna prescribed for the individual was not just a particular diet, but rather a complete health regimen or way of life. According to the Prince of Medicine, "the regimen for maintaining health consists essentially in the regulation of (1) exercise, (2) food, and (3) sleep."[66] Just as Avicenna recommended a special diet for each person possessing a particular constitution, or suffering from a certain illness, so too did he advocate that exercise be tailored to one's needs. "**There is an exercise**," he observes, "**which is appropriate for each individual**. Gentle exercise (e.g., swinging: rocking in a swing) is beneficial for those who are debilitated by fevers, and are convalescent, and can neither walk nor sit."[67] As for the person in robust health, Avicenna suggests that he should exercise vigorously. The types of exercise, who should use them and to what extent, what time of day the person should exercise, the relationship between eating and exercise: these and other factors concerning the profitable application of exercise Avicenna thoroughly discusses in the *Canon*. He does the same with the category of sleep, which demonstrates again how he continually sought to present the individual a total package for the maintenance and restoration of health.

The medical practice of Avicenna and the other Arab and Arabized physicians of his era, with its wholistic emphasis, parallels the teachings of the present-day Natural Hygienists, who also contend that many factors influence and determine one's state of health. For example, Shelton lists in his *Correct Food Combining* book 19 factors which he says influence health and well-being. This list, he notes, is not exhaustive, but does give a good accounting of the most important influences. They are: pure air; pure water; cleanliness, internal and external; sleep; temperature maintenance; pure wholesome foods; exercise; sunshine; rest and relaxation; play or recreation; emotional poise; security of life and its means; pleasant environment; creative useful work; self-mastery; belonging; motivation; expression of the natural instincts; indulgence of the aesthetic senses. Most of these factors are examined and discussed at length in the *Canon*, a book written approximately 1,000 years ago; and so, once again in the area of health, it can be said with justification that nothing new is under the sun. This illustrates why it is so important for one to stick to the basics—getting plenty of sleep, eating wholesome foods, etc.—for the basics are eternal, and will always promote good health and well-being.

Along these lines, many of today's practitioners of Preventive Medicine think that they have hit on something new because they treat not just the physical condition, but also the psychological or emotional well-being of the patient. However, this wholistic approach to health care has probably been around for thousands of years. Avicenna, we are told, "was no less aware than modern physicians of the psychosomatic nature of certain illnesses."[68] A famous story exists of the Prince of Medicine displaying his skills in diagnosing a "head case" and recommending the right cure for it:

For many months a young nobleman lay sick unto death of a strange malady against which the potions and cures proposed by the learned doctors called in to treat him were of no avail. In despair, his relatives summoned to his bedside the most famous doctor of the land. When Avicenna (for he it was) arrived, he examined the ailing youth briefly and then asked to be left alone with him. Holding the patient's pulse, he said: "Tell me, my son, about yourself, your life, your position with your family, your plans for the future." "I am very ill and like to die," was all the youth's reply. "Do not upset yourself like this, you will surely live," replied Avicenna. "Tell me, what think you of women?" And, feeling the youth's pulse quicken, he went on: "Has your heart never been captivated by a woman's beauty?" "No, no," exclaimed the youth hotly. "Why do you say 'No' to me," said Avicenna, "When your whole body cries out the answer 'Yes'? What is the maiden's name?" Finally, after a long silence, the young man spluttered out the name of his beloved. Avicenna summoned his parents and announced solemnly: "The patient is suffering from an incurable disease. He is lovesick and fears to tell you of the woman who has won over his heart. There is but one cure—marriage." Some days later, after the wedding festivities were over, Avicenna returned home, leaving the young nobleman in the care of his new wife and fully restored in mind and body. [69]

Another "head case" Avicenna took on is reported in the Persian book *Chahār Maqāla* (the "Four Discourses") that was written in 1155 CE by a court-poet of Samarqand named Nizāmī-i-'Arūdī. Browne relates the story:

A certain prince of the House of Buwayh was afflicted with melancholia and suffered from the delusion that he was a cow. "Every day," says the author ['Arūdī], "he would low like a cow, causing annoyance to everyone, and crying 'Kill me, so that a good stew may be prepared from my flesh'; until matters reached such a pass that he would eat nothing, while the physicians were unable to do him any good." Finally, Avicenna, who was at this time acting as prime minister to Ala el-Dowleh, was persuaded to take the case in hand, which in spite of the pressure of public and private business, political, scientific and literary, with which he was overwhelmed, he consented to do. First of all, he sent a message to the patient bidding him to be of good cheer because the butcher was coming to slaughter him, whereat, we are told, the sick man rejoiced. Sometime afterwards Avicenna, holding a knife in his hand, entered the sick-room, saying, "Where is this cow, that I may kill it?" The patient lowed like a cow to indicate where he was. By Avicenna's orders he was laid on the ground bound hand and foot. Avicenna then felt him all over and said, "He is too lean, and not ready to be killed; he must be fattened." Then they offered him suitable food, of which he now partook eagerly, and gradually he gained strength, got rid of his delusion, and was completely cured.[70]

If we were to say one final word about *The Canon of Medicine*, it would be that this Preventive Medicine masterpiece of Avicenna's shows how knowledgeable the Arab and Arabized physicians of the era of Rhazes, Haly Abbas, and Avicenna were, and also how skillfully these practitioners of the "ancient medicine" applied and synthesized their knowledge in a wholistic manner.

Having finished our review of the *Canon*, we can now proceed in our investigation of the life of Avicenna. As we recall, the Prince of Medicine was enjoying the most pleasant and productive days of his adult life, serving in the court of the Amir of Isfahan, Ala el-Dowleh; this lasted 14 years, from 1023 CE to 1037 CE. In 1036 CE or 1037 CE the Amir was forced to defend his possessions against his rivals, the Ghaznavids of eastern Persia. The sequence of events which followed comprise the last phase of Avicenna's life. Afnan describes what occurred:

Accounts of the sequence of political events during this period are contradictory, and the dates not very reliable. We are told that in the year in which Ala el-Dowleh was fighting a Ghaznavid army chief, Avicenna, while in the company of the Amir, was seized by a severe attack of colic. Fearing the prospect of being left behind if the Amir were defeated, Avicenna took heroic measures to cure himself, and in one

day injected himself eight times, with the result that his intestines were ulcerated. Nevertheless, he accompanied his patron in his flight, and at their next stopping place "the epilepsy which sometimes follows colic manifested itself." He continued to treat himself by injections, and one day when he desired to be injected with two measures of celery-seed, one of the physicians attending him put in five measures instead. The excess of celery-seed aggravated the abrasions. "He also took *mithridatum* for the epilepsy; but one of his slaves went and threw in a great quantity of opium, and he consumed the mixture; this being because they had robbed him of much money from his treasure, and they desired to do away with him so that they might escape the penalty of their actions."

Such was the state of his health when Avicenna was carried into Isfahan. He continued to prescribe for himself, though he was so weak that he could hardly stand on his feet. When he felt a little better, he once more attended the court of the Amir, and is said to have indulged in excesses for which he again suffered in health. Once again Ala el-Dowleh marched on Hamadān and again Avicenna accompanied him. On the way he had a severe relapse; and when they finally reached their destination, he realized that his strength was ebbing fast; his body had no longer the strength to repel the disease. It was then that he gave up all treatment and took to saying, "the manager who used to manage me is incapable of managing me any longer, so there is no use trying to cure my illness." He lingered for a time in this condition and died not long after his return to Hamadān. He was buried outside the town in June or July, 1037 CE, at the age of fifty-eight.[71]

A different, but no doubt mythical, story of Avicenna's death exists. Asimov relates it:

According to one story which has survived, Avicenna wished to vanquish death and achieve immortality. He is said to have prepared forty different products which his pupil was to administer to him in a predetermined order, immediately after his death. The pupil faithfully accomplished this task, and to his great astonishment the inert body of his master became supple and youthful as he injected the medicines. His face became pink, he began to breathe again… and then came the moment to administer the last capsule, which would bring about the Master's resurrection. Unable to contain himself, the pupil seized the capsule… but his hands trembled, it slipped from his fingers, and the mysterious liquid soaked away in the sand.[72]

Of these two stories, the first account by Afnan unquestionably has to be regarded as the most reliable portrayal of what actually happened. Assuming Afnan's version is correct, it is interesting to note (1) the extreme measures Avicenna took to try to recover from the colic, and (2) once he regained a semblance of health, his neglecting to apply principles of Preventive Medicine to his own case. We read that Avicenna "in one day injected himself eight times, with the result that his intestines were ulcerated." Normally, practitioners of Preventive Medicine would not employ such drastic remedies, being content to rely on gentler methods of treatment so that the body has an opportunity to heal itself. Avicenna undoubtedly would have followed this conservative approach were it not for his fear of coming into the hands of the enemy. In any case, his physical condition grew worse, thanks to his receiving improper medication from first an incompetent physician and next a deceitful slave. Avicenna had to be carried back to Isfahan, and we can excuse his adverse physical state and manner of self-treatment on the dangerous circumstances and bad luck he encountered during the military campaign. But, it is harder to understand the Prince of Medicine's resumption of his high-living ways once he attained a modest recovery from his severe illness. We recall Avicenna stating in the *Canon* that the art of maintaining health is concerned with "the prevention of putrefactive breakdown" and "the safeguarding of innate moisture from too rapid dissipation, and maintaining it at such a degree of strength that the original type of constitution peculiar to the person shall not change even up to the last moment of life." He continues by stating that "this is secured by a suitable regimen." The regimen Avicenna followed after getting back on his feet was hardly suitable for a man who so

recently had been in an extremely debilitated state. We read that the Prince of Medicine "is said to have indulged in excesses for which he again suffered in health." Surely, Avicenna must have realized that the health setbacks he was experiencing from his excesses signaled signs of the loss of his innate moisture and/or putrefactive breakdown in his body. Also, he must have felt some alarm over his constitution, which formerly was strong, but after his near-fatal illness had become considerably weak. These indicators should have been clear enough warning signs that he needed to do a better job of nursing himself, and to not rush back into things. Instead, he tempted the Fates.

Avicenna was not perfect, obviously, despite his brilliance and vast learning. He probably miscalculated his own state of health, which calls to mind the old saying that doctors make their own worst physicians. However faulty Avicenna was in assessing his general physical condition after returning to Isfahan, he certainly knew when his time was finally up. We recollect that towards the end he declined further treatment and, seeing he was finished, stated, "the manager who used to manage me is incapable of managing me any longer, so there is no use trying to cure my illness."

With the death of Avicenna the labors of one of history's most intelligent and extraordinary men came to an end. Jūzjānī recalls the genius of the man:

> One of the remarkable things about the Master was that I accompanied and served him for twenty-five years and I did not see him take up a new book and read it right through. Instead, he used to look up the difficult passages and the complicated problems and see what the author had to say, so as to discover the state of his learning and the degree of his understanding.[73]

Fortunately, the death of Avicenna did not prevent his knowledge from being passed on to future generations, including our own. This being the case, the challenge now before us is to revitalize and spread the Prince of Medicine's teachings, along with the similar teachings of other outstanding Arab or Arabized physicians such as Rhazes and Haly Abbas, so that people today and in the years ahead can experience the benefits that a wholistic approach to health confers.

10. Hibat Ullah

"The Hippocrates of the Age"

In 1073 CE, thirty-six years after Avicenna's death, the world was blessed with the birth of Hibat Ullah, who developed into being another great Arabized physician. A Christian, like many of the other Arabized physicians, Hibat Ullah was proficient in Persian, Arabic, and Syriac. He lived in Baghdad, and as a doctor focused on being a general practitioner; he didn't do surgery. So outstanding was he in his profession that, as Elgood informs us, "he became court physician to Caliph al-Muqtafī and to his successor al-Mustanjid. The former is said to have received him regularly once a week and to have allowed him the privilege of sitting in the royal presence. His conduct was so regular and his gravity so remarkable that it is said that during the frequent visits that he made to the palace of the caliph, he was heard only once to speak in jest. All writers of that era agreed in praising him from every point of view. One writer described him as follows:

He was "the Hippocrates of the Age," the "Galen of the Epoch." His talents carried medical science to the acme of perfection; none of the ancient doctors reached the height to which he attained. His life was long and his days prosperous. When I saw him, he was an old man of a pleasing aspect. His sweetness of character, indicated by his looks, was found on trial to be real. His mind was quick, his sentiments exalted, his thoughts aspiring, his sagacity felicitous, and his judgement solid.[1]

An important factor responsible for Hibat becoming known as "the Hippocrates of the Age" is the fact that his house was adjacent to Nizamiyya college, the largest university of the medieval era; its convenient location no doubt greatly assisted him in researching and writing many medical

books, most of which were likely completed during the early to mid-1100s CE. Some of these books were: 1) commentaries on the writings of the ancient Greek physicians, and 2) commentaries on medical works written by fellow Arabized physicians. One of his more notable books was *Commentary on the Traditions of the Prophet*, with some of these traditions having to deal with medicine and the maintenance of one's health. Importantly, as Elgood points out, "he also wrote a pharmacopoeia, which replaced that of Jundi-Shapur, which had been composed by Sahl bin Sapur [aka Sābūr Ibn Sahl] and which had previously been in general use for a long time."[2] Obviously a man of great learning, we cannot be surprised to learn that when he died, his personal library filled twelve wagons.

Now, one would think that in order to be called "the Hippocrates of the Age," Hibat would also have had to have produced some remarkable cures during his career; and, in fact, he is said to have achieved exactly this. Elgood reports that "in one case he cured a girl in coma by subjecting her to a cold bath followed by sudorifics. Another time a patient was brought to him who sweated blood in the summer. This was cured by a diet of bread and apples."[3] We should mention that a sudorific is a substance that induces sweating; many herbs, such as aniseed, chamomile, and marigold, are sudorifics. We don't know which sudorifics Hibat used to help bring the girl out of her coma, but clearly they were effective.

Besides being the personal physician to two Caliphs, Hibat's other main career accomplishments included his being first the physician-in-chief of the prestigious 'Adudi Hospital in Baghdad and then later on serving for many years not only as the chief of all the physicians in Baghdad, but also as the president of the board of medical examiners.

The caring, compassionate nature of Hibat's personality is evidenced by this description Elgood provides of him:

> [He] refused to see any patient below the rank of a prince, excepting the very poor. An enormous fee he once refused to accept from a merchant for this reason. His house was next to Baghdad's Nizamiyya college. When any of the law students there fell ill, he used to have them brought to his house and would take care of them himself until cured and able to return to work.[4]

It is too bad that Hibat Ullah is no longer with us, serving as a fantastic role model for the all-too-many doctors who today restrict their medical practice to only those patients who are affluent or who have health insurance while not accepting as patients the very poor who have no means of paying for any health care they receive. Unfortunately, as the old saying goes, all good things must come to an end, and Hibat's exemplary life came to its end on Christmas Day in 1164 CE. He had lived for 91 years, which indicates that whatever diet (no doubt a predominately plant-based one) and lifestyle he had adopted and followed had worked extremely well for him. He was one of those rare historical figures whose death brought sadness to the hearts of countless people, as Elgood relates: "In so great affection was he held by the people of Baghdad that the inhabitants of both sides of the river accompanied his corpse to the church and attended the funeral service. Not one of them, it is said, stayed away."[5]

11. Al-Samarqandi and his *Medical Formulary*

Of all the sciences developed by the medieval Arabized Muslims, pharmacology was the most long-lasting in its influence, occupying a dominant position in Western Europe all the way up to the beginning of the 19th Century. We have already seen that Al-Kindī wrote a medical formulary in the 9th Century CE and Hibat Ullah authored a pharmacopoeia in the early to mid-1100s CE. Yet another medical formulary—significantly more advanced than the one by al-Kindī—came into being, likely sometime in the early-1200s CE. This one was written by the eminent Persian physician, Najīb al-Dīn al-Samarqandi.

Very little is known about the life of al-Samarqandi, but based on his name, he probably was born in and spent much of his early life in Samarqand, an important city located in what nowadays is east-central Uzbekistan. At some point, perhaps once he had established himself as a physician, al-Samarqandi moved to Herat, which nowadays is located along the western border of Afghanistan. In al-Samarqandi's time, Herat would have presented any accomplished physician an excellent opportunity to enjoy a successful career. Herat was known as the "Pearl of Khorasan", being the key gateway city connecting western and eastern Asia. It enjoyed a population of 1,600,000 people who it is said resided in over 440,000 houses. Noted for its fine metal goods production, Herat also had 12,000 shops and over 350 colleges. The city flourished during the rule

of the Ghurids (eastern Iranian Tajiks) who captured the city in 1175 CE and it continued to prosper beginning in 1214 CE under the rule of Khwarazmian Empire (the Turko-Persian Sunni Muslim empire whose rule extended over Central Asia, Afghanistan, and Iran from 1077 CE to 1231 CE). Al-Samarqandi would most likely had resided in Herat during the rule of both the Ghurids and Khwarazmians and seen his career and medical science interests develop and progress in the manner that he wished.

Clearly an extremely learned physician, he wrote a considerable number of medical books and treatises, all written in Arabic, some of which are as follows:

"Food and Drink and What Relates to Them"
"On Medicine"
"On the Cure of Pain in the Joints"
"Simple Drugs"
"On the Principles of Compounding Drugs"
"On the Mode of Composition of the Layers of the Eyes"
"On Drugs Prepared by Pharmacists"
"The Last Word on Treating the Ill"
"On the Treatment for One Who Has Been Poisoned, or Who Has Had a Poisonous Bite, and Similar Cases"

In addition to the above listed works, three other books of his are known, including one explaining the treatment of diseases by diet, and finally his two most important books. These latter books are his *Etiology and Treatment of Diseases* and the one we will be examining here—*The Medical Formulary of Al-Samarqandi.*

Al-Samarqandi's medical formulary, translated into English by Martin Levey and Noury al-Khaledy, came out in 1967 as a book entitled *The Medical Formulary of al-Samarqandi and the Relation of Early Arabic Simples to Those Found in the Indigenous Medicine of the Near East and India*. In this work Levey and al-Khaledy provide a highly informative Introduction. Describing al-Samarqandi's medical formulary in general terms, they tell us the following:

> The organization in the medical formulary of al-Samarqandi is much more detailed than in the similar work of his famous predecessor, al-Kindī. The titles in al-Samarqandi's text of the nineteen chapters is sufficient to bear this out. The more exacting arrangement in the latter work makes it simpler to be used as a handbook for practicing physicians. The accretion of pharmacological knowledge in the four centuries [of the Arab Civilization] became so great that the medical formulary model of drug text had to be supplemented by other forms of description.[1]

Specifically, al-Samarqandi's book is divided into 19 chapters, some of which are: 1) syrups; 2) pills and aperients; 3) emetics; 4) gargles; and 5) bath aromatics. The categories of some of these chapters is similar to those found in al-Kindī's medical formulary. What is not similar are the percentages of the origin of the materia medica listed in the two formularies. Levey and al-Khaledy point out that in al-Kindī's medical formulary "31% of the materia medica comes from Persian-Indian sources, 33% from Mesopotamia, 25% from Greek origins, 5% from Arabic, and 3% from ancient Egyptian sources;" by contrast, "in al-Samarqandi's Medical Formulary "54% of its materia medica originates from Persian-Indian sources, 20% is Babylonian, 17% is Greek, 6% is pre-Islamic Arabic, 2% is Egyptian, and less than 1% is Chinese."[2]

The discrepancy between al-Kindī's formulary and al-Samarqandi's formulary with respect to the composition of their materia medica can be explained in much the same way as we understand that the world our grandparents experienced as children is not the same world that we ourselves now experience. Levey and al-Khaledy apply this reasoning to explaining the difference between al-Kindī's and al-Samaqandi's formulary, stating: "In time and place, there is a great difference between these two men [al-Kindī and al-Samarqandi]. Al-Kindī, who worked in the 9th Century and whose parents came from Arabia, wrote his work [his Medical Formulary] in Baghdad, a crossroad of the ancient caravan routes and an intellectual center. Al-Samarqandi, who was in Baghdad for a time, lived and worked hundreds of years later in Herat, an important city of ancient Persia, having many cultural ties with India and the East. It would be logical therefore to assume, a priori, a difference between the materia medica of the Persian and that of the Baghdad physician." Levy and al-Khaledy then add that "with the establishment of the Muslim hegemony in the Near East, trade with the Middle and Far East prospered so that Indian and also some Chinese simples found a permanent role in Muslim pharmacology."[3]

When Levey and al-Khaledy spoke above about "some Chinese simples," it should be pointed out that a simple is a single medicinal herb, and when more than one herb was used to prepare a drug, it was known as a "compound drug." Al-Samarqandi and the other Arabized physicians frequently prescribed compound drugs to their patients.

In trying to help a patient overcome an illness or disease, we see that al-Samarqandi endeavored to limit as much as possible the means necessary to effect a cure. In other words, he would prescribe certain foods to the patient, if those alone were sufficient to restore the patient's health. If not, then he would prescribe a single medicinal herb—i.e., a simple—to the patient to take. Only if that proved inadequate to bring about a cure would he then prescribe a compound drug containing one or more medicinal herbs or other medicinal substances (such as honey). In his *Medical Formulary* al-Samarqandi explains why he recommends and prioritizes the foods-then simples-then compounds approach to treating a patient:

> When we can treat with foods that can act as drugs, we should not treat with drugs, and if we are compelled to do so, we should use drugs that act as foods. If recourse is had to pure drugs, we should not go beyond those that are simple, as far as possible, for that is easier for the nature of the patient to bear and more effective in the illness, as Galen said concerning compound drugs: "The drugs that are known for their many uses (i.e., their usefulness in various diseases) are of no very great help in even one of these disorders, because, since they are compounded from various drugs, each one of which is of use in a particular illness, the amount of the drug that is of use in each individual illness present in the complete draught of the drug compounded for use in a number of illnesses is small. It is never so useful in the diseases for which it is administered as the same quantity of the simple drugs that are of use in these illnesses."[4]

Al-Samarqandi's minimalist approach to healing is clearly seen in what he recommends be given a patient who has a fever. In his *Medical Formulary* he tells us in Chapter 1, whose topic is "Syrups and Robs," what he had found to be the most effective treatment of a cold:

> The special drink is extremely simple; it is clear water which is the most useful drink for those afflicted with a sharp fever for it possesses a strong gentleness, is quickly penetrative, and has a lightness in nature. The Prophet, may the grace and peace of God befall him, said that fever is the exhalation of hell and to cool it with water. This is because all drinks aside from it contain nutrition which requires nature to work on it. Its presence then will be a retardant during its strong activity in combatting sickness.[5]

The drinking of pure water that al-Samarqandi recommended for feverish patients mirrors what the world-famous Mayo Clinic on its website (mayoclinic.org) advises for those who have a fever measuring a temperature of 102° F or less. The Mayo Clinic recommends the following for a child 2-17 years of age: "Encourage your child to rest and drink plenty of fluids. Medication isn't needed." For an adult age 18 years and up, their recommendation is much the same: "Rest and drink plenty of fluids. Medication isn't needed." Only if a fever is above 102° F in temperature does the Mayo Clinic recommend additional measures be taken. Clearly, though, in most instances—that is to say, fevers measuring 102° F or less—al-Samarqandi's "drink pure water" recommendation is sufficient to successfully treat one's cold.

By now it should be apparent that al-Samarqandi's emphasis as a physician is on the importance of letting Nature play the central role in healing. Giving the patient drugs, he maintains, should not be the first recourse. States al-Samarqandi:

> The physician should not treat everything of a minor character or a small change occurring in the body with a drug. Rather, he should treat it by changing the method of management and by adjusting the necessary basic conditions. He must not stir up anything nor impair the body in its natural functions. It is more difficult to quiet the stirring than to stir the quiet. Whenever we can, we should treat by nutritive drugs, and if compelled, by pure drugs not going beyond the simples as much as possible.[6]

Al-Samarqandi provides an interesting discussion on honey is his *Medical Formulary's* Chapter 2 on "Electuaries and Confections." Even most people possessing a large vocabulary don't know what an "electuary" is, so we'll point out here that it is a medicinal substance that's mixed with honey or another sweet substance. In many instances the needed and prescribed medicinal substance could be very bitter, so clearly it would be wise to mask its bitterness in order for the patient to down the medication and not reject it. Al-Samarqandi, as we'll see, preferred honey to serve as the masking agent used in an electuary. He explains:

> Honey contains favorable properties and has good action. It prevents whatever is mixed with it from changing and deterioration. When honey is used, one may expect it to be an assist in curing. It is delightful and appealing to nature for its properties besides being nutritious, pleasant, and removing the distastefulness and disagreeableness of medicines; it clarifies and ripens the thick remainders, purifying them. Also, in regard to its properties, it mixes with the particles of what is compounded with it, extracts its strength, and mixes them together.[7]

When al-Samarqandi described honey as being "nutritious," he may have been aware of the foods consumed by many centenarians. Dr. Paavo Airola, in his book *Rejuvenation Secrets from Around the World*, presents the research findings of the famed Russian biologist, Dr. Nicolai Tsitsin. Surveying 200 centenarians living in Russia, Tsitsin found "that a large number of them were beekeepers. And *all of them*, without exception, said that their principal food had always been honey!" Importantly, the honey these 100-year-olds ate was raw (unprocessed) and contained lots of bee pollen. Airola informs us that "the miraculous rejuvenation property of pollen-rich honey is attributed to the fact that pollen is nature's own propagator of life. It is the male germ cell of the plant kingdom. …Both honey and pollen have been found to be miraculous rejuvenators, largely by improving general health, preventing disease, increasing the power of the body's own immunological mechanism, and stimulating and rejuvenating glandular activity." After listing many more major health benefits one eating pollen-rich honey will experience, such as increased calcium retention, prevention or cure of anemia, improved healing process in a myriad of diseases

and disorders (arthritis, poor circulation, etc.), he comes to this conclusion: "Pollen and honey have, indeed, age-retarding, health-building, and rejuvenating properties."[8]

Turning to the *Medical Formulary's* Chapter 8, whose topic is "Lozenges," al-Samarqandi tells us how lozenges are made and what they are used for:

> Lozenges are compounded substances prepared for many purposes. It is not expected that they be stored, as are confections, for a long time. They are compounds which, it is expected, will be used immediately and should not be stored long for the future since their strength is quickly lost. They are also affected by changes of the air which enters into them. Some of them are cold. They are prepared for the hot humor and acute fevers. They are made from seed of endive, lettuce, the two cucumbers, purslane, rose, nenuphar, violet, barberry, sandal, camphor, and so on.[9]

We can see why al-Samarqandi included purslane in his above list of botanicals that are beneficial in the treatment of a fever when we take into account the findings of Dr. Sepide Miraj, which were published in his 2016 paper, "Healing Properties of Purslane: A Systematic Review Study" (published in *Der Pharmacia Lettre*, 2016, 8(19): pp. 437-441). In reviewing 63 scientific studies on purslane, which is a short herb plant common to the Middle East, Southern Europe, and India, Miraj found that it provides many therapeutic effects, some of which would be quite helpful in the treatment of a feverish cold. Notably, he found that the herb: 1) "showed a significant anti-inflammatory effect," and 2) provided a potent broncho-dilatory effect (that is, opens up the patient's lungs, making it easier for the patient to breathe).[10] We see that for a lozenge to combat fever al-Samarqandi also recommends the inclusion of barberry, which is a plant widely distributed worldwide and which has been used in traditional medicine since ancient times. In a paper by Mozdeh Sarraf *et al*, "Investigating Functional Properties of Barberry Species: An Overview," published in September, 2019 in *Science of the Science of Food and Agriculture,* the paper's authors state that barberry "can be used as a pain-killer, as well as for the relief of fever, diarrhea and vomiting." Mozdeh and his co-researchers go on to inform us that barberry's key component—berberine—"has antimicrobial, antifungal and antioxidant properties," all of which would assist a person trying to recover from a feverish cold.[11]

We'll look at one more chapter in *The Medical Formulary of al-Samarqandi*: "Chapter 15: Gargles." In this chapter al-Samarqandi begins by explaining what gargles are and their purpose: "Gargles are either to make gentle the thick humors in the head [i.e., head congestion] and to ease them down by way of the mouth, or to prevent the thin ones from coming down by thickening them and narrowing the duct. They are also used to reduce swellings in the throat." He next specifically addresses the problem of a stuffed up, congested head, stating that the gargles he recommends one take for this condition "are for ripening so that the one used to gentle the thick humors and make them descend from the brain is hot and sharp. It is made from such drugs as ginger, thyme, barberry, mustard, pepper, marjoram, and mountain-mint."[12] With barberry also appearing in this list of effective treatments for head congestion, we see its versatility in regard to assisting in conditions involving a person having a cold. In regard to thyme, the WebMD website has posted an article titled "Health Benefits of Thyme." In this article the WebMD editorial contributors tell us that thyme belongs to the mint family and "has been used since ancient times for its health benefits." Some of these health benefits, we are next informed, include thyme's ability to "help neutralize some bacterial, parasitic, or viral infections." Mainly responsible for these benefits is thyme's key component, which is known as thymol. We see thymol mentioned next by the WebMD article's authors when they classify thyme as being a natural cough-suppressant and

state the following: “Thyme has been used as a home remedy for coughs, respiratory conditions and bronchitis for years. A small study in 2013 found the use of a thymol spray helped reduce the severity and number of coughs and the urges to cough among participants.”[13] With thymol having been found to be a natural cough-suppressant, one can well see why al-Samarqandi, whose objective among other things was to develop and recommend a gargle that would “reduce swellings in the throat,” suggested that thyme be included in such a gargle.

What perhaps is most admirable about al-Samarqandi is that he helped lead medical science in a modern direction. The authors of the encyclopedia.com website’s entry on al-Samarqandi emphasize this fact, stating: “It is significant that al-Samarqandi did not rely on the old humoral pathology. In fact, he displayed originality in not considering the theory of humors of decisive importance in therapeutics. He dealt with the many ‘accidents’ of drugs and conditions of the body in the much broader framework of medicine and the prescribing of drugs.” Levey and al-Khaledy confirm that al-Samarqandi had advocated a much more modern, open-minded approach towards the understanding and treatment of diseases, exercising prudent discretion while doing so. They note:

> Al-Samarqandi definitely showed dissatisfaction with full acceptance of earlier drug theory [developed by the Greeks and Indians]. To have done so head-on would not have been psychologically proper in al-Samarqandi’s culture. Without objecting too much to the ideas of others, the author stated his own reasons for compounding drugs and their weights used. This was done very clearly and forcefully.[14]

While we do not know, as we’ve said earlier, the year that al-Samarqandi was born, we unquestionably know the year in which he died—1222 CE. How this came about originated in 1221 CE when the inhabitants of Herat where al-Samarqandi lived, who had been living under joint Mongol-Muslim rule that had been established earlier that year, decided to try to restore 100% Muslim rule and get rid of the Mongols. This resulted in a 7-month-long rebellion against the Mongols. However, the rebellion ultimately failed, and in 1222 CE the Mongols returned to Herat in force and killed all the 1.6 million inhabitants of the city. And, not only do we therefore know that al-Samarqandi died in 1222 CE, but we also know the manner of his death; for it turns out that the Mongols carried out their killing spree by beheading all the people of Herat!

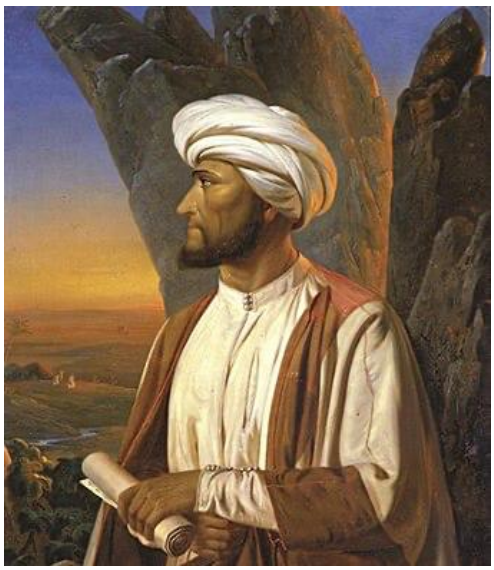
Although the Mongols succeeded in extinguishing the life of al-Samarqandi, they clearly failed to prevent his many valuable books and treatises on medicine and pharmacology from being successfully disseminated throughout the Islamic Civilization. What other works al-Samarqandi might have produced had he lived longer we, of course, do not know; but, we can only be most thankful for the effort he made to see that medical science progressed and that such valuable information such as that which is contained in his *Medical Formulary* is available even centuries after his death for people to benefit from.

The Arabized Physicians of North Africa

12. Ishaq Ibn Imran

and his

Treatise on Melancholy



Most historians of medicine maintain that the first major work devoted solely to depression, or melancholy as it was commonly called in olden times, was Robert Burton's book, *The Anatomy of Melancholy*, published in 1621 CE in Oxford, England. Others point out that Avicenna should be accorded credit for this accomplishment, given that his *Canon of Medicine* contains an entire lengthy section on mental illness, wherein he discusses the malady in much greater detail than the Greco-Roman medical writers ever did. In fact, all these historians are wrong. For around 900 CE, over 700 years before Burton wrote his book, and well over 100 years before Avicenna's section on mental illness appeared in his *Canon of Medicine*, the Iraqi-Arab physician, Ishaq Ibn Imran, authored his classic book, titled *Treatise on Melancholy*.

As is the case with quite a few of the outstanding Arabized physicians who practiced medicine during the Golden Era of the Arab Civilization, little is known with certainty about the life of Ibn Imran. However, it is very likely that the city he started his life out at was Baghdad, given that his full name was Ishaq Ibn Imran al-Baghdadi, this latter part of his name meaning "from Baghdad." Historians provide no estimate of the year he was born, but do provide a range of two years, from 907 to 909 CE, for the year in which he died. We can, though, come up with an

estimate of when he was born by examining the time period corresponding to the most important position he held during his career. In doing this, we should first mention that at some point Ibn Imran definitely moved from Baghdad and ended up in Kairouan, which was the capital city of what was called in the 9th Century Ifriqiya, an impressively large and strategically important North African region encompassing northern Algeria, Tunisia, north-central Libya, Sicily, and the southernmost districts of Italy (Apulia and Calabria). Ruled by an Emir, Ifriqiya pledged allegiance to the Abbasid Caliphate in Baghdad, paying it an annual tribute. However, this allegiance was nominal in nature; so, for all intents and purposes Ifriqiya was an independent country, with its rulers during the 9th Century belonging to the Aghlabid Dynasty. What we know about Ibn Imran is that he served as a physician in the royal court of two different Aghlabid emirs—Ibrāhīm II (ruled 875 - 902 CE) and Ziyādat Allāh III (ruled 903 - 909 CE). To develop into being an experienced, excellent physician by the time Ibrāhīm II became emir, Ibn Imran would likely have been born some time from the 820s CE to the early 840s CE, making him anywhere from his early 30s to mid-50s age-wise at the beginning of his service in the emir's court.

What prompted Ibn Imran to move to Kairouan could have been the fact that Kairouan, located 100 miles south of present-day Tunis, flourished during the 9th Century under Aghlabid rule. It possessed a strong tradition of learning, and its buildings, with their wonderful architecture, could only serve to inspire scholars in their pursuit of knowledge. Its most spectacular building was the Grand Mosque of Kairouan, whose grounds contained a university which served as the center of North Africa, not only for Islamic thought but also for the secular sciences, such as the field of medicine. One can well imagine Ibn Imran spending much time associating with men of science and other physicians at this site.

Now, the key question is: because Ibn Imran could have written a book on scores of different health problems, such as heart or kidney disease, what inspired him to author a substantial work on depression, a topic no one else had ever written at length about? The most likely explanation rests with what he witnessed first-hand during his service as a court physician to Ibrāhīm II. We are told by the great 14th Century Arab historian and sociologist, Ibn Khaldun, that Ibrāhīm II provided his emirate 7 good years before he became unhinged by melancholia. When Ibn Khaldun described Ibrāhīm II as having become "unhinged," he wasn't joking. For example, R. D. Osborn in his book, *Islam under the Arabs*, details Ibrāhīm II's deranged, homicidal actions as follows:

> He often conducted executions personally. He once ordered the execution of 300 palace servants after discovering at dinner that a napkin had been mislaid. He executed 8 brothers and his own son on a vague suspicion. He ordered the execution of every one of his daughters upon birth. When he learned that sixteen of his daughters had escaped notice and had grown into adulthood, he held a reception for them, greeted them kindly, and then had them immediately beheaded. When his mother gave him two cultured female slaves which she hoped would please him, he sent her a note of thanks, accompanied by the girls' severed heads on a tray.[1]

In order to show you that the above episodes constitute just a fraction of the many gruesome stories about Ibrāhīm II which could be related, we'll note this additional story Osborn provides: "His wives he tortured in a variety of ways. Some were built up in walls and left to perish of hunger and thirst; some were strangled; other had their throats cut."[2] In short, Ibn Imran worked for a mentally-ill mass murderer, and so writing his *Treatise on Melancholy* may have been an attempt

on his part to try to explain, not only to others but also to himself, the origins, nature, and treatment of such abnormal behavior. Let us now take a close look at Ibn Imran's book.

In the March 3, 2012 issue of the *Journal of Affective Disor*ders, Adel Omrani *et al* present in a paper, "Ibn Imran's 10th Century *Treatise on Melancholy*," their analysis of Ibn Imran's path-breaking work. The authors begin their paper by providing a brief overview, noting that the *Treatise on Melancholy* "is the oldest known manuscript dedicated entirely to the topic of melancholia, and including current-day manic-depressive illness or bipolar disorder. Ibn Imran conceptualized melancholy within Galen's system of four humors, a view that was not uncommon in his time. [However,] he placed a premium on clinical observation, valuing it more than prevailing Galenic theories regarding the four humors and their role in guiding medical treatments. He also identified minor forms of the disorder, and recommended particular treatment options, including herbal medicines, for different presentations of melancholy."[3]

In regard to the causes of melancholy, we see that Ibn Imran's conclusions hardly differ at all from what today's psychiatrists believe are the main factors that lead to the development of this illness. Omrani *et a*l state: "According to Ibn Imran, melancholy could be hereditary, passed to the progeny through malfunction of the sperm or uterus, or acquired independently from biological influences. Causes of disease attributable to either biological or environmental influence are not a far cry from today's view that unipolar depression and bipolar disorder are both genetically transmitted and influenced by environmental factors."[4] Furthermore, Ibn Imran maintained in his book that faulty dietary habits could also trigger the condition, for "he discussed at length the ways in which consumption of certain foods and wine could lead to melancholy, and noted that the 'prolonged abuse of wine' inflicts disease beyond and more serious than melancholy."[5]

Ibn Imran's above assertion that consuming wine could lead to melancholy is one that contemporary scientists have investigated. K. Gemes and six co-researchers conducted a study from 1998-2010 CE of 5,087 participants with respect to their alcohol consumption. The study's paper, "Moderate Alcohol Consumption and Depression — A Longitudinal Population-based Study in Sweden," was published June, 2019 in *Acta Psychiatrica Scandinavica*. Gemes *et al* report that they analyzed "the association between alcohol consumption and depression while controlling for previous alcohol consumption and depressive symptoms and other time-varying confounders." Most of the wine variety grown and consumed in Tunisia where Kairuoan in located is rosé, which contains an 11.5 - 12.5% alcohol content. Therefore, drinking several glasses of rosé wine would result in consuming a considerable amount of alcohol. How does consuming a large amount of alcohol daily affect one's chances of developing depression? Gemes *et al* answer this question. We see in their paper the following:

> Results: Consumers of 7-14 drinks/week had a depression risk similar to that of light-drinkers. Hazardous drinking was associated with a higher risk of depression than non-hazardous alcohol consumption.
>
> **Conclusion: Hazardous drinking increased the risk of depression**.[6]

In short, seven scientists—Gemes and his six co-researchers—confirmed what Ibn Imran pointed out in his *Treatise on Melancholy* in 900 CE, over 1,100 years before the scientists conducted their study!

In Ibn Imran's day there was, of course, no brain imaging technology, such as MRI (Magnetic Resonance Imaging), DTI (Diffusion Tensor Imaging) CT Scan, etc. that could help

him diagnose whether or not a patient had some sort of mental illness. So, how did he determine that a patient was mentally ill? As Omrani *et al* relate, he focused on observing how the patient's behavior changed over time and also on the nature of the behavioral change:

> In Ibn Imran's view, diagnostic clues should be given by the patient, and diagnosing manic-depressive illness depended more on the variation of mental state (course) rather than the presence of certain symptoms. He stressed the importance of knowing the temperament of a patient prior to the onset of illness. For example, a patient previously "fiery" who turned calm and impassive would indicate the presence of disease; similarly, a patient historically "slow to respond and calm" turned "quick to answer and courageous" would allow physicians to conclude that the patient was ill. In addition to describing manic-depression, Ibn Imran stressed less standard and less obvious presentations that might today be considered as either Bipolar Disorder - Type II or Bipolar Disorder - Not Otherwise Specified. By developing diagnostic criteria for "soft" clinical presentations, Ibn Imran contributed novel attributes to the definition of melancholy, which were previously overlooked by esteemed physicians such as Rufus of Ephesus, and continue to be overlooked by clinicians today, though these presentations are far from rare.[7]

In order for Ibn Imran to use and perfect his above observational approach to the diagnosis of various forms of depression, he needed to have treated lots of people who were struggling with mental health issues. It is presumed that, aside from his duties as court physician to the Emir, he worked at Kairouan's hospital and/or operated a private medical practice out of his home, like so many Arabized physicians did. Wherever he worked, though, there would likely have been plenty of depressed people who needed help and would have sought his services, given that 9th Century Kairouan was the largest and most prosperous city in Ifriqiya.

We are informed by Omrani *et al* that 61% of the pages in Ibn Imran's *Treatise on Melancholy* concern themselves with the treatment of depression; and appearing in these pages are recipes for over 150 medicinal treatments for the disease, with the overwhelming majority of them being herbal prescriptions. So impressed were Omrani and his co-researchers in Ibn Imran's selection of the herbs he prescribed for his mentally ill patients that they felt compelled to state that "his pharmacopeia warrants further study if for no other reason than over 50 medicines cited in the *Treatise* are still used in medical fields other than psychiatry today."[8] They then informed us how Ibn Imran generally had his patients take these medicines: "The prescriptions would be taken on a regular on-off pattern of several days to a typical total of 30 doses, as long as the melancholic condition persisted."[9]

Importantly, Omrani *et al* provided the names of some of the botanical ingredients contained in the prescriptions for depression that Ibn Imran gave his patients, these being plant and nut oils, opium poppy, *Polypodium vulgare* (a type of fern), and gall-nut (a plant excretion). In examining nut oils, we can see why Ibn Imran chose to give them to his melancholic patients, for nuts contain a high amount of L-tryptophan, which turns out to be an amino acid possessing mood-boosting, anti-depressive qualities. This is confirmed when examining Kelli Miller's September 24, 2021 article, "L-tryptophan," published on the WebMD website. We are informed the following about L-tryptophan: "L-tryptophan is an essential amino acid that helps the body make proteins and certain brain-signaling chemicals. Your body changes L-tryptophan into a brain chemical called serotonin. Serotonin helps control your mood and sleep. You get all the L-tryptophan that your body needs by eating a healthy, balanced diet. **Low levels of L-tryptophan have been seen in people with depression. Some claim up to 60 milligrams of L-tryptophan daily may help improve your mood or ward off mental health disorders such as**

depression."[10] Miller then lists some of the foods which contain a moderate to high amount of tryptophan, with one of these foods happening to be "tree nuts, including peanuts and peanut butter."[11]

We should mention that Ibn Imran seems not to have limited his patients' treatment for depression to just having them taking medicines. "He also," note Omrani *et al*, "viewed a balanced diet and physical fitness as important components in the treatment of disease."[12] That being the case, he likely also prescribed or at least strongly encouraged his patients to engage in some sort of regular physical activity as well as eat healthy food combinations at meals.

The *Treatise on Melancholy* which, to repeat, was written over 1,100 years ago, constitutes a remarkable achievement on Ibn Imran's part, for even today the book contains much of value for health professionals who treat people struggling with mental illness. Omrani and his co-researchers reach a similar conclusion, summarizing Ibn Imran's findings this way:

> Ibn Imran's ideas and definitions of melancholy are surprisingly modern and lacked the demonological or supernatural explanations which dominated Europe from the Middle Ages until the mid-17th Century. His discussion of melancholy, originating from the heart of the Middle Ages in one of the world's most religious civilizations, is rather similar to later studies of melancholy in the "rationalist" world of the Enlightenment. There is much to ponder in the work of Ibn Imran, including recognition of how, in many ways, our current views differ little from our medieval forbears.[13]

13. Isaac Judaeus

and his

Guide for Physicians

Born Isaac ben Solomon Israeli to Jewish parents in Egypt in 832 CE, this fabulous Jewish physician and philosopher of the 9th and 10th Centuries was commonly called and better known as Isaac Judaeus in Medieval Europe. He is said to have lived the first half of his life in Cairo, gaining a reputation as an outstanding optometrist. Regarded as a genius by his peers, Isaac seems to have been much like Avicenna, having studied numerous sciences (natural history, astronomy, medicine, mathematics, etc.) to such a great extent that people claimed that he knew all the "seven sciences." In 904 CE he was nominated to be a court physician to the last Aghlabid Emir of Ifriqiya,

Ziyādat Allāh III. The following three years, 905-907 CE, he left the optometric practice he had operated for many years in the Cairo area and moved to Kairouan to study medicine under Ibn Imran, whose life and *Treatise on Melancholy* book we have already covered.

For the rest of his life Isaac lived and worked in Kairouan, and he likely made his change in residence from Cairo to Kairouan with little difficulty as he never married nor had any children. Though Jewish, most people in Kairouan would have known him by the Arabic version of his name—Ishāq bin Sulaymān al-Isrā'īlī. This phase of his life, working in Ifriqiya's capital city, proved to be extremely productive. We read the following in the "Isaac ben Solomon Israeli" entry contained in the *Encyclopedia Britannica*:

> Some five years after his arrival, Isaac entered into the service of al-Mahdi, the founder of the North African Fātimid dynasty (909 - 1171 CE), whose capital was Kairouan. At the request of the caliph, Isaac wrote eight medical works in Arabic. All were translated into Latin in 1087 CE by the monk Constantine. The works were eventually published in Lyon under the title of *Omnia Isaac Opera* ("All of Isaac's Works"). Isaac's scientific works include treatises on fevers, urine, pharmacology, ophthalmology, and ailments and treatments. He wrote also on logic and psychology, showing particular insight in the field of perception.[1]

Specifically, the key medical works Isaac wrote were:

Kitāb al-Hummayāt, "The Book on Fevers"

Kitāb al-Adwiyah al-Mufradah wa'l Aghdhiya, a work in 4 sections on remedies and ailments

Kitāb fi l-tiryāq, a book on *Theriac*, the all-round remedy

Kitāb al-Istikat, a medical and philosophical work on the elements

Musar Harofim, "Guide for Physicians"

Kitāb al-Baul, "Book on Urine"

In addition, Isaac wrote a treatise on diet, and most importantly was the first physician to write about tracheotomy in Arabic. Isaac, in fact, wrote all of his medical works in Arabic, which, as we've noted before, was the language of science in the Middle East, North Africa, and Iberia during the Middle Ages. And, his medical books and treatises were highly valued. Richard Gottheil and M. Seligsohn, the writers of the *Jewish Encyclopedia's* entry on Isaac, tell us that in "Kairouan his fame became widely extended, the works which he wrote in Arabic being considered by Mohammedan physicians as 'more valuable than gems.' His lectures attracted a large number of people, of whom the two most prominent were Abū Ja'far Ibn al-Jazzār, a Mohammedan, and Dunash ibn Tamim."[2]

Isaac's *Book on Urine* merits a brief mention, as it contained an important new finding. We are informed of this by Shaul G. Massry, the author of a paper, "Isaac Judaeus Israeli, a Jewish Founder of the Origins of Nephrology," which was published in the Nov. 1, 2009 issue of the *Journal of Nephrology*. Massry states that in the *Book on Urine* Isaac's "original contribution was in the concept of the seeping of fluid and sediment from blood into the kidney and from the kidney to the bladder. This concept corresponds to glomerular filtration and tubular secretion."[3] No doubt of most help to the practicing physician in Isaac's day was that the book also "describes the formation of urine and the value of visual examination of urine for the diagnosis and prognosis of disease."[4]

Although Isaac's treatise on diet has not yet been translated into English, it no doubt offers lots of good advice which Isaac himself likely followed, for ***he lived to be over 100 years old***, dying in Kairouan in 932-935 CE. In his later years serving as the doctor of the Fātimid Caliph al-Mahdi, who reigned from 910 - 932 CE, Isaac would have been 78 years old when he began this job, and very easily could have remained as the court physician well into his 80s. We learn that his mind at that advanced age was still very sharp, for Gottheil and Seligsohn inform us that "the Caliph enjoyed the company of his Jewish physician on account of the latter's wit and of the repartees in which he succeeded in confounding the Greek Al-Hubaish when pitted against him."[5]

Another insight into the personality and nature of Isaac Judaeus has been provided to us by Saul Jarcho, who translated into English from a Hebrew version Isaac's *Guide for Physicians* book, with this translation appearing in the February, 1944 issue of the *Bulletin of the History of Medicine*. Having thoroughly analyzed everything Isaac said in the *Guide for Physicians*, which one has to do in order to produce an accurate translation, Jarcho came up with this complimentary description of the man:

> Isaac's general attitude is that of a cultivated high-minded physician, well-read in the classics of medicine, and gentlemanly in his behavior toward patients and colleagues. He is also an educated man, humane and sympathetic but not soft-headed. He is notably sensible and recognizes the influence of the mind over the body. He trusts nature and not drugs, and recognizes that the physician does not make the cure but merely prepares the way for Nature.[6]

It is in reading the *Guide for Physicians*, though, that we gain the best insight into Isaac's character and how he serves as a model Preventive Medicine physician. In reading the many sayings of his contained in this book, it is inconceivable to imagine Isaac, unlike all too many present-day allopathic doctors, ever over-billing a patient, ordering an expensive but unnecessary test for a patient, or giving a less than 100% effort in trying to help a patient overcome a health problem. In short, the highest ethical standards guided his medical practice. Here now are the words of Isaac Judaeus which, as mentioned earlier, the Muslim physicians of his day regarded as "more valuable than gems":

Whenever you can accomplish the treatment by means of diet and curative foods, do not use drugs, because most of them are enemies and opponents of nature, especially the cathartics.

Be eager to visit and treat the needy, for no virtuous act is greater than this.

The physician does not make the cure. He merely prepares and clears the way for Nature, who is the real healer.

Quiet the patient and bring him glad tidings of his recovery even if you are not certain of it, for in this way you will strengthen his natural forces.

There are diseases the treatment of which consist merely of your forbidding the patient to continue his bad habits. The patient will keep asking the physician for tangible treatment; if none is given, he will consider the physician deficient.

Many fools will ask your advice and inquire as to your method of treatment merely so that you should tell them whether the patient will get well or die. In their imagined wisdom they say to themselves, "If the patient is due to get well, there is no need of a physician, and if he is doomed to die, the physician cannot prevent it." But the fools do not realize that when the physician declares that the patient will recover, this is true on condition that the patient is treated and managed properly.

Whenever possible, feed the patient with foods similar to those which he eats when he is well. Let him also eat at his customary time. This will strengthen him.

In treating mild diseases do not rush to change the temperament or to use purgatives, since usually nature alone will suffice, with the aid of a good regimen.

He whose work is to heal human bodies, which are the greatest of created things, should examine and study very accurately the sicknesses thereof, and should do this work with mature consideration and circumspection so that no irretrievable blunders are made. Concerning this the wise man has said: "If you see a physician immediately give opinions and forever boast of his cures in any disease for which you consult him, regard him as a fool."[7]

14. Ibn Al-Jazzār

and his

Medicine for the Poor

Ibn Al-Jazzār treating his patient and taking notes about his disease

During the Golden Age of the Arab Empire, hardly any physicians came close to achieving as much during their life as did Abū Ja'far Ibn Al-Jazzār. Born around 895 CE in Kairouan and called Algizar in Latinized Europe, Ibn Al-Jazzār was what many would call a "doctor's doctor," due to a combination of his profound medical expertise and knowledge, his high productivity as an author of many medical works, and the selfless principles which guided his medical practice. For example, Sleim Ammar, in a paper titled "Ibn Al Jazzār and the Kairouan Medical School of the Tenth Century AD," presented in September, 1998 at the Congress of the International Society for the History of Medicine, states that Ibn Al-Jazzār "led an exemplary life," and next provides some details that led him to this conclusion:

He studied the Koran, theology, grammar and literature at an early age and received his first instruction in medicine from his father Ibrahim (an oculist) and from his uncle Abu-Bakr, a renowned Kairouan doctor. His principal master was Isaac Ibn Suleiman Al Israeli [i.e., Isaac Judaeus], under whom he studied Greek and Arab works such as those of Dioscorides, Galen, Hippocrates, Aristotle, Sabur Ibn Sahl, Al-Kindī, Ibn Māsawayh, and Ibn Omrane [i.e., Ibn Imran].

Of a calm and reserved temperament, Ibn Al-Jazzār refused lucrative official positions at court, preferring to give consultations without charge to the poor. He taught and practiced in the prestigious scientific institution, "Beït al-Hikma," or House of Wisdom, built in the reign of Caliph El Moez (r. 953-975 CE). Exemplifying the distinct roles of the physician and pharmacist in his own practice, he published at least 43 works, pamphlets and epistles, principally in the fields of medicine and pharmacy.[1]

Much of Ibn Al-Jazzār's instruction as a youth took place at the mosque 'Uqba ibn Nāfi' (the Great Mosque of Kairouan). The teaching was generally oral, given that paper was not widespread in the 9th and early 10th centuries CE, ands scrolls were quite costly and scarce. And, as one can expect when instruction is provided in a mosque, much emphasis was made on the teachings of the Koran. One of these Koranic teachings—treat the poor and sick for free—Ibn Al-Jazzār took to heart. Gerrit Bos, in his 1998 paper, "Ibn Al-Jazzār on Medicine for the Poor and Destitute," published in the *Journal of the American Oriental Society*, explains this particular teaching's origin and how Ibn Al-Jazzār put it into practice:

Like Judaism and Christianity, Islam enjoins the believers to treat the poor and sick for nothing. An early treatise, the *Adab al-tabib* ("Conduct of the Physician") by al-Ruhāwī (9th Century) gives rules regarding the outward appearance of the physician, his education and proper conduct, and states that he should charge the wealthy in order to help the poor… We know from Ibn al-Jazzār's biography that the case of the poor was so important to him that he refused, unlike many of his colleagues, to enter the service of important personages. He led an austere life, devoted himself to the study and practice of medicine, received and examined his patients during the hours of consultation, and analyzed their urine, while his servant Rachiq administered to them the required medicines, free of charge.[2]

Perhaps the greatest influence on Ibn Al-Jazzār with respect to his adoption of a policy to charge nothing to treat a poor person came from Isaac Judaeus, who served as his main medical schooling instructor. As we recall, one of Isaac's most famous recommendations to a physician was "Be eager to visit and treat the needy, for no virtuous act is greater than this." Now, this policy of treating the poor for free should be quite doable from a financial point of view for any physician, as long as the physician has plenty of affluent patients. In Ibn al-Jazzār's case, he himself did not die a poor man. Far from it. By charging only his affluent patients while at the same time not charging his poor patients a thing, he died around 979 CE at age 84 possessing a savings of 24,000 gold dinars. With the gold dinar used in Ibn al-Jazzār's day weighing 4.2 grams and converting the number of dinars Ibn al-Jazzār held upon his death into ounces, one comes up with the extraordinary total of 3,555 ounces of gold that the physician's estate's executor had the "problem" of figuring out how to disburse.

Ibn Al-Jazzār usually operated his medical practice out of his home in Kairouan, along with, as Ammar tells us, "his assistant Rachiq, working from a purpose-built pharmacy in the hall of the master's house."[3] However, Kairouan's inland location resulted in the city's residents experiencing hot, uncomfortable summers, with the average daily high from July 1 through August 31 being between 95-99° F. Ibn Al-Jazzār was married, although without having any children, and it may have been his wife who insisted that they live in a much cooler spot during the summer. No matter whose idea it was, Ibn Al-Jazzār spent each summer living and operating his medical practice out of the Fortress of Monastir, located on the east-central coast of present-day Tunisia, a spot averaging a daily summertime high that's at least 10 degrees less than Kairouan's. The editors of the Wikipedia.com entry on Ibn Al-Jazzār inform us that "during the heat of the summer, he went to Monastir and lived in a ribat with valiant soldiers who watched the boundaries. Ibn

Al-Jazzār prepared himself the medicines and had an assistant serve them who stood in the vestibule of the house, and who collected the fees of the consultations."[4]

As a professor of medicine so to speak at Kairouan's "Beït al-Hikma," Ibn Al-Jazzār was, according to Ammar, "reputed for the rigor of his teaching and his skill in therapeutics."[5] He seems to have been a serious, no-nonsense type of person who avoided situations that could have called his character into question. The Wikipedia writers on his life state that besides being "calm and quiet," Ibn Al-Jazzār "did not attend funerals or weddings and did not take part in festivities. He had great respect for himself. He avoided compromises, did not attend the [royal] court and members of the regime."[6] They then relate the story of him treating the son of Qādī al-Nu'man, the highest and most powerful judge in the Fātimid Caliphate, and refusing to accept some very expensive clothing that the qādi wanted to give to him in thanks for helping his son.[7] If Ibn Al-Jazzār had accepted the expensive gift, how could he say "no" in the future to any other high government official who offered him a large amount of money for his medical services? Ibn Al-Jazzār correctly figured out that saying "yes" just once to accepting payment from a high government official for his treatments and medical expertise would result in an endless demand for his services from other government officials.

Loyalty and respect comprised another aspect of Ibn Al-Jazzār's character. He was friends with the Emir, and in order to not disrespect the Emir, he chose not to fulfill his strong desire to visit Al-Andalus (i.e., Muslim-controlled southern and central Spain). At the time the Umayyads ruled over Al-Andalus, whereas the Fātimids, whose Islamic beliefs differed from those of the Umayyads, ruled over much of North Africa and Egypt. Relations between the two governments were therefore tense. A similar reason, caused by the Emir's Shia beliefs and policies he enacted that made it hard for pilgrims to traverse through Fātimid-controlled territory in order to reach Mecca, led Ibn Al-Jazzār to not attempt to fulfill his other strong desire, which was to make the pilgrimage to the Kaaba in Mecca. In short, displaying loyalty to and respect for his friend took precedence with Ibn Al-Jazzār over his trying to satisfy his own personal desires.

We were informed earlier that Ibn Al-Jazzār was highly productive as a writer, especially of medical works. Let's take a closer look at some of these works, beginning our examination with Ibn Al-Jazzār's most famous and influential book—*Zād al-Musāfir wa qūt al-hādir* ("Provisions for the Traveler and Nourishment for the Settled"). Gerrit Bos, in his 1993 paper, "Ibn Al-Jazzār on Women's Diseases and Their Treatment," published in *Medical History*, describes this work:

> This work is not as the title suggests, a guide for the traveler, but a systematic and comprehensive medical handbook. It consists of seven books, which discuss the different diseases and their treatment from head to toe. Though comprehensive, it is written in a concise style, so that it can be taken on a journey and consulted if no physician is available. But it is still a voluminous work, covering 303 folios in the MS Dresden 209. The work contains many valuable quotations from the works of famous physicians and philosophers such as Hippocrates, Aristotle, Rufus, Galen, Paul of Aegina, and Polemon. Already at the beginning of the eleventh century it had been translated into Greek. Its popularity in Jewish circles is attested by the fact that it was translated into Hebrew three times. …Translated into Latin by Constantine the African in 1124 under the title *Viaticum peregrinantis*, and commented upon by the Salernitan masters from the thirteenth century on, Ibn Al-Jazzar's *Zād* became one of the most influential medical handbooks in medieval Europe. It became one of the medical textbooks that were widely used in medical schools (Salerno, Montpellier) and in universities (Bologne, Paris, Oxford).[8]

Interestingly, Ammar points out that the 11th Century translation of *Zād* into Greek made it one of the first four Arab works to appear "in a western language, and as such was taught in the European medical faculties at least until the 17th Century."[9] We can better understand why Ibn Al-Jazzār's book was used in European medical schools for so long when we see in greater detail its contents, a very good idea of which Ammar provides:

> *Zād al-Musāfir* opens with the classification of diseases, and their names in Persian, Greek and Syriac together with their popular synonyms followed by their etiology. A brief physiology precedes symptomatology and treatment, minor surgery, finally the use of minerals (salts, copper, arsenic and mercury). His work covers illnesses of the head and neck, lung and stomach and other viscera, the liver and kidneys, the genital organs and skin; viz. vascular cephalalgia, epilepsy, migraine, hemiplegia, mental confusion, comas, acute delirium, amnesia, insomnia and its treatment, narcolepsy and paralysis agitans. A chapter is devoted to love-sickness. The various skin complaints include hair-loss, leprosy, eczema, ulcers and abscesses.[10]

One skin problem mentioned in the above list—leprosy—actually constitutes surprising information. Ufuk Tasci, in his 2020 paper, "Ibn Al-Jazzār Identified Contagious Diseases 1,000 Years Ago," points out the surprising nature of this information, stating: "Common knowledge says that Norwegian physician Gerhard Hansen was the first to identify leprosy's main cause in 1973, but it was Al-Jazzār who identified the disease in his book, *Zād al-Musāfir* (the *Viaticum*). In the *Viaticum* he names the disease, lists the known symptoms, gives the treatment and sometimes indicates the prognosis. During his efforts to treat leprosy, he wrote all the details on antelope leather along with all the diseases he encountered during his travels."[11] From this we see that Ibn Al-Jazzār was the first medical professional by nearly 1,000 years to identify leprosy and its symptoms as well as provide a treatment for the disease.

One chapter contained in the first of the *Zād's* seven books helped in no small way advance the field of mental health. This chapter deals exclusively with melancholy, and Gerrit Bos tells us that this "chapter on melancholy was, next to Ibn Imran's monograph on the same subject, the point of departure for further developments in Christian Western Europe, where this concept played a prominent role in medicine and literature. The mental pathology of the *Zād* stressed the role played by the malady called *'ishq* (love-sickness)."[12]

Chapters 9 through 18 of the *Zād's* sixth book cover women's diseases, with Paul of Aegina (7th Century CE) and Galen (2nd Century CE) serving as the main sources for Ibn Al-Jazzār's nosology (classification of diseases), aetiology (causes of disease) and symptology (symptoms characterizing a medical condition). We see this in the following example provided by Bos, where he provides a comparison between Ibn Al-Jazzār and Paul of Aegina regarding their description of the symptoms displayed by ulcers in the uterus, the topic of Chapter 13.[13] Note how similar the two descriptions are.

Ibn Al-Jazzār	**Paul of Aegina**
Symptoms of these ulcers are the discharge of [purulent] matter, pain, a throbbing pain in the uterus with a severe burning. If the wound is cankering, the color of the purulent	…for the fluid which is discharged varies in its qualities. When the ulcer is inflamed, the discharge is small, bloody, or feculent, with great pain, but when the ulcer is foul,

matter is black and has a stinking smell; it goes with pain and inflammation.

the discharge is in greater quantity, and ichorous, with less pain. When the ulcer is spreading, the discharge is fetid, black, attended with great pain, and the other symptoms of inflammation.

Ibn Al-Jazzār recommended various treatments for ulcers in the uterus, one of them being a suppository consisting of fenugreek meal mixed with the fat of a goose. Interestingly, in *Zād's* sixth book's Chapter 16 on difficult childbirth, the use of fenugreek is once again recommended. Specifically, Ibn Al-Jazzār advises "bathing in water containing fenugreek, seeds of marsh mallow, linseed and peeled barley."[14] (Marsh mallow, incidentally, is a plant belonging to the hibiscus family; Ibn Al-Jazzār was not referring to the puffy, aerated marshmallow candy). Sajad Wani and Pradyuman Kumar in their 2018 paper, "Fenugreek: A Review of its Nutraceutical Properties and Utilization in Various Food Products," provide us an idea as to why fenugreek might be effective in the treatment of an ulcer in the uterus or a difficult childbirth. Wani and Kuman relate in their paper the fact that fenugreek possesses many medicinal effects, such as being antimicrobial, anticancer, antidiabetic, antifertility, and a lactation stimulant. Even more importantly, they also point out: "In ancient Egypt methi [Egyptian name for fenugreek] was used to ease childbirth and to increase milk flow, and modern Egyptian women are still using it today to relieve menstrual cramps, as well as making hilba tea out of it to ease other kinds of abdominal pain. The Chinese call it *hu lu ba* and also use it for treating abdominal pain. Fenugreek remained a key ingredient in a 19th Century patent medicine for dysmenorrheal and postmenopausal symptoms."[15]

Ibn Al-Jazzār's importance regarding our present-day understanding of women's diseases at first glance is not apparent. This is because he made no original discoveries in this field. However, his many chapters on women's diseases in *Zād* which, as we recall, were eventually translated into Latin, allowed physicians in medieval Europe to learn what the ancient Greek and Roman physicians had discovered and knew about these diseases. Indeed, the *Zād's* section on women's diseases served as the primary source of information utilized by Trota, the 11th Century female Italian doctor often regarded as the world's first gynecologist, for her main treatise on gynecology, *Book on the Conditions of Women*, published in the 12th Century in Salerno. Ibn Al-Jazzār, in short, served as a key middleman in this branch of medicine, as Bos explains in summarizing his very important contribution:

In book six, Chapters 9-18 of *Zād al-Musāfir* Ibn Al-Jazzār did not contribute many new elements to the existing discussion of women's diseases. Like most of his Arabic colleagues, he contented himself with faithfully copying the ancient sources, even when they are contradictory. The main reason for this stagnation in this particular area is that Arabic physicians in general did not treat affections of the female genitals themselves, but left them to the midwives without theoretical medical training. It was only in the field of pharmacology that they made an original contribution by prescribing many new compound remedies. Despite the lack of originality of Ibn Al-Jazzār's encyclopedia in this particular area, it is of fundamental importance since it was a major conduit for the transmission of selected ancient gynecological material (above all Galen and Paul of Aegina) to the Latin west.[16]

Among the many other medical works authored by Ibn Al-Jazzār, some of the ones whose contributions to the field of medicine are notable can be said to be:

Kitāb al-l'timād fī al-adwiyah al mufradah ("Basic Treatise on Simple Medicines"). Ammar describes this work as "the second great medico-pharmaceutical treatise by Ibn Al-Jazzār and ranks as one of the most important since the *De materia* of Dioscorides. The *al-l'timād* records

280 simple medicaments and their therapeutic properties, their faking and possible substitutions. Ibn Al-Jazzār describes more than 30 pharmaceutical formulas, some of which are still in use today." Ammar adds that Ibn Al-Jazzār's "broad knowledge of pharmacy marks its recognition and becomes a turning point in its history."[17]

Siassat Essibyane wa tadbiruhum ("Infant and Child Care and the Education of Children"), regarded as being the first complete book on pediatrics and child care.

Kitab al-Mashayikh wa-hifz sihhatihim ("Ailments of the Elderly")

Kitab al-Nisyan wa-Turuq Taqwiyat al-Dhakira ("On Forgetfulness and its Treatment")

Risala fi Asbab al-Wafah (treatise on the causes of mortality)

"Diseases with Identical Causes and Different Symptoms"

"Epistle on Urines"

"The Substitution of Medicaments"

We now direct our attention to a most remarkable book Ibn Al-Jazzār wrote which countless people worldwide who have limited income and very little or no savings would probably consider of greatest value for themselves. This book, *Tibb al-fuqarā wa-al-masākīn* ("Medicine for the Poor and Destitute"), constitutes perhaps the best reflection of Ibn Al-Jazzār's nature as a physician who possessed deep concern and compassion for poor people, treating them regularly and always at no charge. Bos provides the following brief overview of *Medicine for the Poor* and the context in which this book appeared:

> *Medicine for the Poor* is basically a list of remedies for the different diseases from head to foot. The first recipes were for headaches and the last is a recipe for gout. Thus, *Medicine for the Poor* belongs to a special literary genre called "medicine for the poor," a genre which was pursued by several Arab Muslim doctors during the Middle Ages and later on was popular in Western Europe as well.[18]

Throughout his career as a physician Ibn Al-Jazzār prioritized providing affordable health care to the poor. We see good evidence of this in the following statement he made in regard to the purpose of *Medicine for the Poor*: "I have abridged in this small work the treatment of the diseases by means of drugs which can be easily found with the slightest effort and trouble, so that the common, poor, and destitute people will benefit from them."[19]

The practicality and affordability of the treatments Ibn Al-Jazzār recommends in his book to those of limited means is exemplified by the following advice he gives for one who has a headache: "If you have a headache in the summer as a result of a burning heat and walking in the sun, you should take oil of roses, mix it with vinegar, and pour it out over your forehead, but if oil of roses is difficult to find, use instead of it olive oil, and if olive oil is difficult to find, use instead of it vinegar, and if vinegar is difficult to find, use cold water."[20] So, did Ibn Al-Jazzār know what he was talking about when he recommended rose oil be used to alleviate a summertime headache? Well, it turns out that a 2017 randomized double-blinded placebo-controlled crossover study evaluated the efficacy of rose oil on migraine headache sufferers, offering hope for such people. (See "Efficacy of Topical Rose Oil for Migraine Headache" by Maria Niazi *et al*, published in *Complementary Therapies in Medicine*, 2017 Oct.; 34: pp. 35-41.) The study's results showed that inhalation of rose oil, which would occur if the oil was rubbed on one's forehead, was most helpful for providing short-term relief for those who experience "hot" migraine symptoms—symptoms which could well be similar to the headache symptoms manifested by exposure to a hot, burning summer sun.

It was not at all rare for Ibn Al-Jazzār to encounter a situation where even common ingredients such as olive oil or vinegar were not available for use. In such instances he would resort to a Plan B, as we see in his discussion of the treatment of a serious headache: "If the headache is severe, the oil should be mixed with juice of purslane or juice of black nightshade or juice of fleawort; but once, when I was in a village where I did not find any of these ingredients, I mixed the inner part of a pumpkin with juice of unripe, sour grapes."[21] The inner part of a pumpkin, more commonly called its pulp, is composed of a slimy, mushy mass of strings and seeds, and sometimes is referred to as "pumpkin goo" or "pumpkin slime." Given its slimy nature one can see why a pumpkin's pulp might serve as an effective substitute for olive oil in a mixture that normally contained olive oil. It apparently worked for Ibn Al-Jazzār in his treatment of a patient's headache or else he would not have brought it to our attention.

Among the many other curative treatments described in *Medicine for the Poor* that would have been affordable to most everyone living in North Africa in the 10th Century CE we'll mention the one Ibn Al-Jazzār recommends for muscle pain or pain in the hands or feet. He provides this instruction: "Boil fenugreek soaked in vinegar in an earthenware pot until it is well-cooked, pound it, macerate it, and add a sufficient amount of honey, boil and pound it, and smear it on a rag and put this on the place of the pain."[22] We have already seen how Ibn Al-Jazzār recommended fenugreek for cases involving ulcers in the uterus and difficult childbirth, with women's menstrual cramps and abdominal pain reported by Wani and Kumar in their 2018 scientific paper to be reduced via use of fenugreek. What could account for honey being used by Ibn Al-Jazzār as one of the ingredients in his formula to ease muscle pain is the fact that honey is anti-inflammatory as well as being antibacterial, both of which would have a healing effect on sore, inflamed muscles and joints. In their April, 2011 paper, "Honey: Its Medicinal Property and Antibacterial Activity," published in the *Asia Pacific Journal of Tropical Biomedicine*, Manisha Mandal and Shyamapada Mandal state: "There are many reports of honey being very effective as a dressing of wounds, burns, skin ulcers and inflammations; the antibacterial properties of honey speed up the growth of new tissue to heal the wound. The healing properties of honey can be ascribed to the fact that it offers antibacterial activity, maintains a moist wound environment that promotes healing, and has a high viscosity which helps to provide a protective barrier to prevent infection."[23]

The patients that Ibn Al-Jazzār focused on treating—poor, common people living in 10th Century North Africa—are people who would have left very few, if any, written records of their life experiences. Such people generally possessed limited education and therefore were often illiterate; they also would not have had the money to purchase costly scrolls or paper to write on. Most importantly, being limited-income people their time each day usually would have been spent working hard at some low-paying job, trying to survive yet another day by scraping up enough money for food and shelter. However, if these patients Ibn Al-Jazzār treated for free had left us some testimonials, can you imagine what expressions of gratitude they would have provided?

15. Ibn al-Nafīs

The Greatest Physiologist of the Middle Ages

According to many sources, Ibn al-Nafīs, almost universally acknowledged to be the greatest physiologist of the Middle Ages, was born to Arab parents in 1213 CE in a village located near Damascus, Syria. Studying theology, philosophy and literature as a youth, he moved on at age 16 to studying and practicing medicine for the next ten years at the Al-Nūrī hospital in Damascus. His medical school mentor and supervisor there was the hospital's top physician, Muhadhab al-Dīn al-Dakhwār. During this 10-year period in Ibn al-Nafīs' life Damascus and nearby areas experienced frequent turmoil. By way of context, the Sultanate of Egypt, founded by Saladin in 1171 CE, controlled an enormous area stretching from Egypt to southern Anatolia and Kurdistan to the north to Yemen in the southern Arabian Peninsula, as well as to Nubia and eastern Libya; Damascus therefore fell under the Sultanate's jurisdiction. In the 1230s the emirs of Syria initiated a civil war in an attempt to gain their independence from Egypt. Given these unsettled and perhaps life-threatening circumstances, in 1236 CE Ibn al-Nafīs readily accepted the request of Sultan al-Kāmil to move to Egypt and become the chief physician of the Al-Naseri hospital in Cairo.

Ibn al-Nafīs never married. Being single permitted him to devote all of his time to pursuing his medical-scientific interests as well as his career. He practiced and taught medicine for nearly 50 years at the Al-Naseri hospital until in 1285 CE he became chief physician at Cairo's newly-founded Al-Mansūrī hospital, a position he held until his death three years later in 1288 CE. In addition to these jobs, Ibn al-Nafīs also served between 1260-1277 CE as the personal physician of the famous Mamluk Sultan Baybars, who is most noted for stopping the Mongols' advance in the Middle East once and for all, defeating them in 1260 CE in the pivotal Battle of 'Ayn Jālūt, which took place just south of the Sea of Galilee.

Besides serving as Baybars' personal physician, Ibn al-Nafīs also treated other high government officials who no doubt would have been well-to-do individuals. However, he made a serious effort to help make medical treatment affordable and effective for low-income patients, too. Samir Yahia El-Gammal, in his 1992 paper, "Therapy and Medicaments by Ibn al-Nafīs," published in the *Bulletin of the Indian Institute of History of Medicine,* informs us that Ibn al-Nafīs "tried his best to present medicine to the common people as simple as possible, [advocating] the regulation of the patient's diet in the first place, rather than to depend on drugs alone." In short, continues El-Gammal, he recommended that "if the patient can take food instead of any drug, it is strongly advisable."[1] Nonetheless, sometimes drugs are necessary for the treatment of a patient's health problem; in this situation El-Gammal relates that Ibn al-Nafīs "recommended the intake of a single moderate one, as much as possible, instead of using compound drugs," as each component of such drugs "acts separately and independently on the body organs, producing harmful side effects."[2] All of these above recommendations appear in one of the most famous books that Ibn al-Nafīs wrote, titled *Kitāb al-Mukhtār fi al-Aghdhiya* ("The Choice of Foodstuffs"), a book focused on emphasizing the importance of following a proper, nutritious diet in order for one to enjoy and maintain good health. It should be pointed out that Ibn al-Nafīs' recommendation that "if a patient can take food instead of any drug, it is advisable" mirrors exactly the teachings of many of the great Arabized physicians who preceded him. We recall, for example, Isaac Judaeus stating: "Whenever you can accomplish the treatment by means of diet and curative foods, do not use drugs, because most of them are enemies and opponents of nature, especially the cathartics."

As we'll soon see, Ibn al-Nafīs was a prolific author, particularly of health and disease-related works. One of these works, *Al-Mūjaz fi al-Tibb* ("A Summary of Medicine"), a handbook on medicine numbering about 500 pages that enjoyed great popularity with medical students and practicing Arab physicians, contains an interesting chapter on the treatment for an ear infection. In his 2005 MuslimHeritage.com article, "Ibn al-Nafīs and Vinegar," Mohamed Hussein Benamer relates that one of Ibn al-Nafīs' patients once was experiencing a discharge from his ear, which caused him pain and some hearing loss. Ibn al-Nafīs tackled the problem by administering to this patient a treatment whose main ingredient happened to be vinegar. Benamer expands on the story:

> Ibn al-Nafīs was describing a condition similar in its symptoms and signs to outer ear canal infection (*otitis externa*); the ear was painful and tender, slightly swollen and producing a smelly, colored discharge. His patient had a degree of hearing impairment. The vinegar was mixed with some milk and almond paste, and slightly heated before it was introduced drop by drop into the ear canal.[3]

The treatment appears to have been successful, for Benamer then states, "I do not think that Ibn al-Nafīs would have known that vinegar works by restoring and maintaining a low pH and hence an acidic environment which is not suitable to bacteria and fungus growth. In his day, microorganisms like bacteria had not been discovered yet. Treatment was based on careful observation and trial."[4]

Another thing that Ibn al-Nafīs would not have known about is what a scientific study conducted in the 21st Century discovered regarding vinegar's antibacterial effect. In 2021 Darshne Yagnik and two co-researchers had their scientific paper, "Antibacterial Apple Cider Vinegar Eradicates Methicillin Resistant *Staphylococcus aureus* and Resistant *Escherichia coli*," published in *Scientific Reports*. Yagnik *et al* found that apple cider vinegar, which would be similar to the type of vinegar Ibn al-Nafīs used on his patient, is extremely effective in killing off dangerous bacteria such as MRSA (i.e., methicillin resistant staphylococcus aureus) and E. Coli (i.e.,

escherichia coli), doing so without harming the body's white blood cells. The scientists describe their study's results and its importance:

Our previous in vitro study highlighted the anti-inflammatory as well as antimicrobial effect of Apple Cider Vinegar (ACV) on non-resistant E. coli, S. aureus and C. albicans. We now extend the antimicrobial activity of ACV against MRSA and rE. coli [i.e., resistant E. coli]. ACV inhibition of bacterial growth is comparable to the inhibition shown by trimethoprim and clindamycin which are typical antibiotics used to treat E. coli and MRSA infections respectively. … Low pH can also effectively destroy microbes. ACV is mildly acidic with a pH of 5.6 compared to acetic acid which has a pH of 4.7. We did investigate the effects of strong organic acids such as hydrochloric and sulfuric acid at a range of concentrations on different microbes, but did not see the same antimicrobial effects as with ACV. The effect of ACV on human blood parameters is scarce. We demonstrate for the first time that ACV did not have any effects on human monocytes in culture, even after 24 hours of direct ACV exposure at high concentrations; verifying that it is not damaging to white blood cells. This is a vital observation since ACV has been consumed as a food supplement for centuries; many people take it daily; hence, any side effects are important to highlight. ACV had toxic effects on microbes, but reassuringly did not affect the integrity of human monocytes in our experiments.[5]

We can now easily see why Ibn al-Nafīs' administration of vinegar mixed with milk and almond paste would have eliminated an ear infection, because if vinegar eradicates antibiotic resistant bacteria, such as MRSA and E. coli, which is what Yagnik *et al* found in their above-described study, then clearly it would have no problem eradicating bacteria which are not resistant to antibiotics; and, the latter were the only type of bacteria around 800 years ago in Ibn al-Nafīs' day.

The rest of Ibn al-Nafīs' *Al-Mūjaz* book has been praised by many, such as Rabie Abdel-Halim in his 2011 MuslimHeritage.com article, "Contributions of Ibn al-Nafīs to the Progress of Medicine and Urology." Abdel-Halim states that "*Al-Mūjaz* shows the skill of Ibn al-Nafīs in classifying his medical knowledge and writing it down with a planned, rigorous and orderly method and a lucid, concise but precise and to-the-point style. It is divided into four main sections."[6] Abdel-Halim then goes on briefly describe the contents of these four sections. Section I sees Ibn al-Nafīs covering two large categories—"the science of maintaining health" and "the science of treating illness." All of Section II is on "Medicaments and Diet." Section III, meanwhile, details "diseases of organs, one by one starting from the brain downwards, describing the causes, diagnosis and treatment." The final large section, Section IV, covers "diseases not specific for a particular organ," such as fevers and swellings.

Before discussing Ibn al-Nafīs' most important works, two other books by him merit a brief mention, these being:

Bughyat al-Talibin wa Hujjat al-Mutatabbibin ("Reference Book for Physicians"), a reference book meant to help physicians accurately diagnose disease, properly treat illness, and correctly perform surgery.

Kitāb al-Muhaddab Fi 'l-Kuhl ("The Polished Book on Ophthalmology") — in this book Ibn al-Nafīs attempts to advance the field of ophthalmology by building on concepts originally developed 400 years earlier by Yuhannā ibn Māsawayh who, as we pointed out in our discussion of his career, wrote the earliest surviving Arabic ophthalmological treatise ("Alterations of the Eye").

Clearly, one of the most important books Ibn al-Nafīs wrote was his *Sharh Kitāb Al-Epidemia* ("A Commentary on Hippocrates' *Of the Epidemics*"). Epidemiology is the branch of medicine which studies the distribution of disease and its impact upon a population, and Hippocrates, known as the Father of Epidemiology, wrote extensively around 400 BCE on the subject. To better appreciate Ibn al-Nafīs' significant contribution to this branch of medicine, we need to understand some of the epidemiological questions Hippocrates studied. Ghazi Kayali, in his article, "The Forgotten History of Pre-modern Epidemiology: Contribution of Ibn al-Nafīs in the Islamic Golden Era," published in the *Eastern Mediterranean Health Journal*, obliges us by providing the following background information:

> In his book, "Of the Epidemic," Hippocrates introduced several concepts of epidemiology that are considered the fundamentals of modern epidemiology. His main thesis was that disease causality can be attributed to climate, seasonal variations and location. He noted that habits, regimens and personal pursuits are all factors associated with disease occurrence. His book included a description of the disease prognosis of several patients. Hence, this was the first epidemiology work to present case series, a modern design for observations studies. For most of the cases, he provided information about age, gender, place of residence and the seasonal conditions at the time of onset of the illness. After describing the symptoms, Hippocrates describes the outcomes in terms of morbidity and mortality.
>
> In another book, "On Airs, Water and Places," Hippocrates presented the thesis that diseases should be studied in light of the season in which they happen, the quality of the available water and the prevailing environmental conditions. Hippocrates drew a distinction between epidemic and endemic diseases, …[introducing] the concept of endemicity in contrast to epidemic diseases that occur out of the routine.[7]

The main reason why Ibn al-Nafīs was able to become extremely interested in epidemiology and eventually write his commentary on Hippocrates' book is because most of the works by Hippocrates had already been translated into Arabic. Fortuitously for the field of epidemiology, Hunayn Ibn Ishāq, who we recall was considered to be the best and most accurate translator in 9th Century CE Baghdad's "House of Wisdom," happened to be the person who translated "Of the Epidemics" into Arabic. It bears mentioning that in general Ibn al-Nafīs was influenced and seemingly often inspired by the writings of his greatest predecessors, notably Hippocrates, Galen, Rhazes, and Avicenna. Accordingly, in the case of his *A Commentary on Hippocrates' "Of the Epidemics*," Ibn al-Nafīs presents a critical appraisal of Hippocrates' original book, and not simply a translation of it.

In reading Ibn al-Nafīs' *Commentary on Hippocrates' "Of the Epidemics*," we see early on Ibn al-Nafīs building upon Hippocrates' observations and findings, and not merely parroting what Hippocrates had already said. As Kayali relates:

> Hippocrates began his book by saying: "In Thasus, about the autumn equinox, and under the Pleiades…" Ibn al-Nafis opened his book by providing an explanation of why Hippocrates specified the location "Thasus," explaining that geographic location and not only climate is important when studying disease occurrence. Both scholars described the distribution of disease by demographic categories, but Ibn al-Nafis explained that people of different ages and genders have different biological processes and occupational hazards that contribute to the onset of disease.[8]

Ibn al-Nafīs' last point—a point not made by Hippocrates—that "people of different ages and genders have different biological processes and occupational hazards that contribute to the onset of disease" is one he no doubt easily arrived at, given the countless patients he had treated over his many years as a practicing physician. For example, Ibn al-Nafīs would have seen elderly

patients much more frequently than young children become afflicted with a particular illness, such as shingles; and vice versa.

Kayali points out another improvement Ibn al-Nafīs made to Hippocrates' book, this one relating to what Hippocrates had to say about what is called in epidemiology the exposure-outcome association:

> Ibn al-Nafīs next explained the exposure-outcome association laid down by Hippocrates. He provides a better definition of the seasons (exposure) using astrological signs, and then categorized outcome under several groups from mild to severe. An example here would be Ibn al-Nafis' categorization of respiratory illness from mild colds to tuberculosis.[9]

The third section of *Of the Epidemics* features Hippocrates discussing among other things seasonality and geographic distribution of disease as well as associated risk factors; Ibn al-Nafīs in his *Commentary* added to the discussion by providing examples of each of these. Finally, Hippocrates dedicates a large portion of his book to detailing multiple cases of illness. Reading these cases clearly inspired Ibn al-Nafīs, for he ended up writing a lot in his *Commentary* in regard to not only the cases cited by Hippocrates, but also about cases of illness he himself had personally treated, as Kayali informs us:

> Ibn al-Nafīs provided some biological explanations for the disease prognosis for some of those cases [cited by Hippocrates]. In addition, Ibn al-Nafīs used what Hippocrates described to compare and contrast cases and outbreaks of diseases that he handled. For example, Ibn al-Nafīs compares an outbreak of malnutrition in Damascus to that described by Hippocrates. Both scholars clearly describe the location of cases as if drawing an outbreak map as did John Snow hundreds of years later. In addition, Ibn al-Nafīs described cases of anthrax, linking incidence to climate and demonstrating that when a person has minor uncovered wounds, there is a risk of infection that typically ends in death.[10]

Hippocrates also discussed various epidemiological phenomena in another book of his, known as the *Aphorisms of Hippocrates*. Not surprisingly, Ibn al-Nafīs responded by authoring another major medical work of his own—*Commentary on the Aphorisms of Hippocrates*. Once again, Ibn al-Nafīs expanded upon points made by Hippocrates, improving our understanding of how illness originates and spreads. Kayali makes this clear to us. He states that when Hippocrates in his *Aphorisms* "discussed the role of seasonality, changes in climate, rain and wind on disease incidence, Ibn al-Nafīs attempted to provide biological plausibility to this by explaining how these factors affect different organs. For example, Ibn al-Nafīs explained that winds may carry diseases, hence demonstrating the occurrence of airborne respiratory illness. When discussing the role of location, Ibn al-Nafīs explained that different patterns occur in different locations due to differences not only in climate but also in the body types of people living in different locations, hence suggesting the role of genetics in disease predisposition."[11]

So, how do we assess Ibn al-Nafīs' role in the development of epidemiology as not just an important, but in certain times when an epidemic or even a pandemic is raging, an extremely important branch of medicine? We can gain a good understanding of Ibn al-Nafīs' role by viewing the below flow chart.

Hippocrates →	Ibn al-Nafīs and other Arabic translators →	medieval Latin translators →	16th Century scientists →	modern-day epidemiologists

To simplify the meaning of this flow chart even more, we can say that if Hippocrates is the Father of Epidemiology, then Ibn al-Nafīs and the translators who translated Hippocrates' Greek-language works into first Arabic and next into Latin can be called the Midwives of Epidemiology. In short, Ibn al-Nafīs' efforts along with those of the translators were absolutely crucial in the development of modern epidemiology. Kayali provides this enlightening summary of how present-day epidemiology came into being and where Ibn al-Nafīs falls into the picture:

> Modern epidemiology was shaped by the work of 16th Century scientists. However, when discussing the history of pre-modern epidemiology, discussing the work of Hippocrates only is a common mistake. Hippocrates remains the father of epidemiology, but the field was a topic for Muslim scientists who excelled during the Islamic Golden Age between the 8th and 16th centuries. Influenced by Hippocrates, these scholars, and in particular Ibn al-Nafīs, moved the science of epidemiology forward. Hence, their work deserves to be credited [given that] the works of Hippocrates were preserved through their translation into Arabic and through the critical appraisals of them by Muslim scholars. Renaissance and modern era scientists then studied the Latin translations of Arabic works which led to the rise of modern epidemiology.[12]

We noted earlier that Ibn al-Nafīs was a prolific author, for what else would you call a person who single-handedly writes an encyclopedia on medicine that contains 80 volumes? Indeed, that is what Ibn al-Nafīs did. Titled *Kitāb al-Shāmil fi 'l-Sinā'a al-Tibbiya* ("The Comprehensive Book on the Art of Medicine"), Ibn al-Nafīs' plan was for the encyclopedia to comprise 300 volumes, but he died after "only" completing and publishing 80 of its volumes. Providing a summary of the Islamic world's medical knowledge as of the 13th Century, 28 volumes of the encyclopedia still exist, and it rightly is regarded as perhaps the largest medical encyclopedia ever written by a single person. Now, what motivated Ibn al-Nafīs to undertake such a colossal project? Well, it turns out that Ibn al-Nafīs and other scientists and scholars in the Levant and Egypt experienced the ultimate wake-up call in 1258 CE, thanks to the Mongols. Abdel-Halim explains:

> Scholars and scientists in Damascus and Cairo, such as Ibn al-Nafīs, were motivated to write such works after the massive destruction of Baghdad and its great library by Hulagu's army in 1258. Ibn al-Nafīs was 50 years old in 1258 and at the peak of his medical experience. The scholar/scientists attempted to cope with this disaster by trying to preserve the scientific heritage pioneered in Baghdad, the leading center of Islamic civilization in that era.[13]

As astounding an accomplishment as his authoring an 80-volume medical encyclopedia was, Ibn al-Nafīs' greatest contribution to mankind appears in his book, *Sharh Tashrih al-Qānun* ("Commentary on the Anatomy of Ibn Sina's *Canon of Medicine*"). In this book, published when he was only 29 years old, Ibn al-Nafīs presents his discovery—one of the most momentous discoveries in the history of physiology: the first correct description of pulmonary (heart-lungs) circulation. Prior to Ibn al-Nafīs' discovery, the prevailing theory on pulmonary circulation was one devised by Galen in the 2nd Century CE and which Avicenna in the 11th Century CE continued to espouse. The writers of the Wikipedia.com entry on Ibn al-Nafīs describe Galen's theory—a theory reliant upon "invisible pores" (which don't really exist) in the cardiac septum:

> Galen taught that the blood reaching the right side of the heart went through invisible pores in the cardiac septum, to the left side of the heart, where it mixed with air to create spirit, and was then distributed to the body. According to Galen, the venous system was separate from the arterial system except when they came into contact through the unseen pores.[14]

Some experts on human anatomy believe that in conducting his research on pulmonary circulation, Ibn al-Nafīs engaged in dissection in order to arrive at his discovery, although Muslim

tradition generally banned the practice. Regardless of whether or not Ibn al-Nafīs performed dissections on human cadavers, he ended up dismissing out of hand Galen's theory, stating: "The blood, after it has been refined in the right cavity, must be transmitted to the left cavity where the (vital) spirit is generated. But there is no passage between these cavities, for the substance of the heart is solid in this region and has neither a visible passage, as was thought by some persons, nor an invisible one which could have permitted the transmission of blood, as was alleged by Galen."[15] Expanding on this point, Ibn al-Nafīs added:

> Blood from the right chamber of the heart must arrive at the left chamber, but there is no direct pathway between them. The thick septum of the heart is not perforated and does not have visible pores as some people thought or invisible pores as Galen thought. The blood from the right chamber must flow through the vena arteriosa (pulmonary artery) to the lungs, spread through its substances, be mingled there with air, pass through the arteria venosa (pulmonary vein) to reach the left chamber of the heart, and there form the vital spirit.[16]

The key improvements and corrections Ibn al-Nafīs made to the faulty Galenic-Avicennian theory facilitated his discovery of the circulatory system, and they have been summarized as follows by the eminent endocrinologist and historian of Egyptian medicine, Dr. Paul Ghalioungui:

A) Denying the existence of any pores through the interventricular septum.

B) The flow of blood from the right ventricle to the lungs where its lighter parts filter into the pulmonary vein to mix with air.

C) The notion that blood, or spirit from the mixture of blood and air, passes from the lung to the left ventricle, and not in the opposite direction.

D) The assertion that there are only two ventricles, not three as Avicenna stated.

E) The statement that the ventricle takes its nourishment from blood flowing in the vessels that run in its substance (i.e., the coronary vessels) and not, as Avicenna maintained, from blood deposited in the right ventricle.[17]

Ibn al-Nafīs reveals in his *Sharh Tashrih al-Qānun* book many other very important physiological and anatomical discoveries he made. For example, in regard to the brain, he first relates Galen's erroneous theory that "blood reaches the brain itself at the section called forebrain through the dura mater which divides the vault longitudinally into two equal halves at the sagittal suture," after which he criticizes it and then corrects it as follows: "The blood permeates first to the back ventricle (hindbrain) then to the other two ventricles. Dissection confirms this and disproves what they say. The permeation of arteries into the cranium is well known not to be from the front ventricle."[18] What's particularly interesting about this description of brain blood-flow is Ibn al-Nafīs' mentioning that dissection proved Galen's theory to be wrong, while at the same time verifying Ibn al-Nafīs' alternate explanation. Based on this remark by him, if Ibn al-Nafīs didn't actually perform dissections himself, he at the very least observed them. This is evidenced by the fact that Ibn al-Nafīs for the first time in history also correctly identified the bladder wall as being composed of two layers, for how else, other than by conducting or observing a dissection, could he have made this discovery?[19] In any case, dissections proved indispensable to advancing the science of physiology, and Ibn al-Nafīs clearly recognized this.

How the heart actually receives its nutrients had originally been a mystery, but later on thanks to a wrong contention by Avicenna became a widespread erroneous belief. Ibn al-Nafīs, fortunately, was able to rectify the misunderstanding by pointing out that the coronary arteries are what, in fact, supply the heart its nourishment. He explained: "Again his [Avicenna's] statement

that the blood that is in the right side is to nourish the heart is not true at all, for the nourishment is from the blood that goes through the vessels that permeate the body of the heart."[20]

Meanwhile, Psychology, the science of the mind, saw Ibn al-Nafīs discredit one of its most cherished, long-held beliefs—a belief originally popularized by Aristotle, the famous 4th Century BCE Greek philosopher. Ridiculous as it seems to us nowadays, Aristotle claimed that the "psychic faculties" come from the heart. Ibn al-Nafīs disproved this, showing in reality that cognition, sensation, imagination, and animal locomotion all originate from one's brain.[21] Another remarkable accomplishment on Ibn al-Nafīs' part relates to the following remark he made in his book, *Theologus Autodidactus*: "Both the body and its parts are in a continuous state of dissolution and nourishment, so they are inevitably undergoing permanent change."[22] This statement is understood to be the first-ever description of *metabolism*, which entails catabolism, the process of living matter being broken down into simple substances, operating concurrently with anabolism, the process whereby the nutrients of food build living tissue.

In the 13th Century CE there were, of course, no microscopes. Even so, Ibn al-Nafīs managed to figure out that very tiny blood vessels—what we call capillaries—must exist. He asserted: "There must be small communications or pores between the pulmonary artery and vein." This prediction of his came true over 400 years later in 1661 with the official discovery of the capillary system made with the use of a microscope by the Italian scientist, Marcello Malpighi.[23]

How we have come to know about Ibn al-Nafīs' physiological discoveries is the same as how we came to know about his epidemiological research findings: the work of the Latin translators. Sharif Kaf Al-Ghazal and Rumaisa Zubairi in their 2022 paper, "Ibn al-Nafīs—The First Who Described the Pulmonary Blood Circulation," published in the *Journal of the British Islamic Medical Association*, tell us the following:

> Ibn al-Nafīs' coronary circulation discoveries were unknown in Europe until 300 years later when Andrea Alpago of Belluno translated some of al-Nafīs' writings into Latin in 1547. Andreas Vesalius, in the second edition of his book, *De Fabrica*, published in 1555, 8 years after Alpago's translation, agreed with al-Nafis, stating "I still do not see how even the smallest quantity of blood can be transfused through the substance of the septum from the right ventricle to the left." Whereas in Vesalius' book's first edition, published in 1543, 4 years before Alpago's translation of al-Nafīs, Vesalius agreed with Galen's mistaken contention that the blood "soaks plentifully through the septum from the right ventricle into the left. . ."[24]

So, as we see, if neither Alpago nor anyone else had translated into Latin Ibn al-Nafīs' *Sharh Tashrih al-Qānun*, then Vesalius, the highly-esteemed 16th Century Flemish scientist who became known as The Father of Anatomy, would have continued to believe in Galen's totally erroneous theory that blood travels from the heart's right ventricle to the left via visible or invisible pores through the septum, thus retarding perhaps for decades or even longer the advance of physiology.

Described as a modest but very self-assured man, Ibn al-Nafīs died after a short illness at age 75 on December 17, 1288 CE; historians have not specified the nature of his illness. In any event, shortly before his death Ibn al-Nafīs donated his home and entire personal library to the Qalāwūn Hospital in Cairo, which had been built and completed in 1285 CE by Sultan al-Mansūr Qalāwūn. This hospital operated for over 500 years and was the most important place where

medieval scholars and physicians could have read and/or copied any of Ibn al-Nafīs' many books, including his 80-volume medical encyclopedia.

Ibn al-Nafīs' legacy of bestowing extremely valuable and new knowledge on mankind has rarely, certainly in the field of medicine, been matched. In fact, from the 13th Century CE onwards Muslim historians have regarded Ibn al-Nafīs as being the greatest physician in history. Biographers Taj al-Dīn al-Subkī and ibn Qādī Shuhba exemplify this opinion of Ibn al-Nafīs, writing: "As for medicine, there has never been one on this earth like Ibn al-Nafīs. Some say that after Ibn Sina there has never been one like Ibn al-Nafīs, while some say that he was even better than Ibn Sina in practical treatment."[25] Other biographers focus on Ibn al-Nafīs' remarkable contributions to the science of physiology, calling him the greatest physiologist of the Middle Ages or **The Father of Circulatory Physiology**. Whatever he is called, Ibn al-Nafīs showed us clearly the road that he traveled in living his life, a road which could easily accommodate more travelers, for in explaining his life mission to significantly benefit mankind, he once said, **"Throw light on and stand by true opinions, and forsake those which are false and erase their traces."**[26]

16. The Arabized Physicians of Al-Andalus under the Umayyad Caliphate

As unlikely as it may seem, the Arab Civilization's most spectacular development occurred not in Baghdad, but rather in Al-Andalus. Al-Andalus, or Andalusia as it's commonly called nowadays, in the Middle Ages was comprised of the Muslim-controlled region of the Iberian peninsula, which happened to be most of modern-day Spain and Portugal. Small Christian kingdoms occupied the northern part of the peninsula.

The Arabs, under the command of the Berber governor of Tangier, Tariq ibn Ziyād, crossed the Strait of Gibraltar and invaded the Iberian peninsula in 711 CE with an army of about 12,000 soldiers, most of whom were recent Berber converts to Islam. A much larger army, perhaps numbering 50,000 or more men, commanded by Roderic, king of the Goths, opposed Tariq's force a few miles outside of the southern port city of Cadiz. It proved to be no contest. Tariq's Berber and Arab troops exterminated the Goth soldiers, with Roderic himself also being killed in what's called the Battle of Guadalete (Roderic's body was never positively identified among all the heaps of corpses). After this overwhelmingly decisive victory Tariq split up his army, and the smaller units he formed went about quickly capturing major cities throughout the peninsula, such as Cordoba and Granada. Tariq himself led a force which captured Toledo, which had served as the Goths' capital for nearly 150 years. Upon conquering Toledo, most of the peninsula for all intents and purposes now belonged to the Muslims; over the next two year a few mop up operations led by Mūsā ibn Nusayr, the governor of Ifriqiya (Muslim-controlled North Africa), certified the new ownership, and into history went what had been known as the Catholic Kingdom of Toledo. Interestingly, Mūsā, who seems to have been one of those people who believe in the superiority of

centralized authority (especially when he himself happens to be the "centralized authority") was very displeased with Tariq's actions and reprimanded the commander. Tariq had committed the "grave crime" of not having cleared with Mūsā his plans to invade and assume control over Al-Andalus. Fortunately, Mūsā restricted his punishment of Tariq to simply issuing him a reprimand. Even more fortunately, the "unauthorized" initiative Tariq took to invade the Iberian peninsula ultimately resulted in advancing the world's understanding of medicine by hundreds of years, as we shall soon see.

Once the Muslims assumed control over Al-Andalus, for a little over 200 years Al-Andalus was ruled as an Emirate of the Abbasid Caliphate. As we recall, in 750 CE the Abbasids overthrew the Damascus-based Umayyad Caliphate. In the process the Umayyad prince 'Abd al-Rahman I fled with many other Umayyad supporters, settled in Al-Andalus and established in 756 CE the independent Emirate of Cordoba. The emirate recognized the legitimacy of the Abbasid Caliphate for over 170 years until in 929 CE the Emir of Cordoba, 'Abd al-Rahman III (nicknamed "The Victorious"), after imposing absolute control over all regions in Al-Andalus (many of which had been beset by anarchy), felt confident enough to declare himself the Caliph of Al-Andalus. Al-Rahman III justified his action by charging that the Abbasid Caliph was now more a puppet of the army than the defender of Islam, a charge containing more truth than not. Indeed, by the 10th Century CE the Baghdad Caliphate had become a joke; the army ran the Eastern provinces of the Arab Empire, and installed whomever it wished as Caliph. Al-Rahman III's decision, which was largely political, gave birth to what became known as the Western Caliphate, with the caliphate headquartered in Baghdad now being referred to as the Eastern Caliphate.

Under al-Rahman III's rule external enemies fared poorly. The northern Christian kingdoms of the Iberian peninsula—Leon, Navarre, and Castile—could only fight amongst themselves with success. Whenever the Christians invaded Muslim territory in Andalusia, they always paid the consequences, often over and above battlefield defeats, as exemplified by al-Rahman III's once retaliating by having his troops lay waste to the entire kingdom of Navarre. Meanwhile, Muslim Spain prospered on a fantastic scale. One of the main reasons this was so is because al-Rahman III forever held government spending to a minimum. This policy, combined with an invincible national defense and effective internal law and order, allowed the economy to boom. Money remained in the hands of the productive, and their investments literally transformed the landscape. For example, agriculture became a science, and the countryside looked like one continuous plant nursery. An almanac put out in 961 CE by Rabi' ibn Zayd describes this delightful Andalusian scene:

> In March fig trees are grafted. The young shoots appear, and most of the trees burst into leaf. Sugar cane is planted. The first roses and lilies come into flower. Garden beans begin to ripen. Quails appear. The silkworms emerge. Cucumbers are planted, cotton sown; garden crocus, eggplant, mint and marjoram.
>
> [In May] fruit appears on the olive trees and vines. Bees prepare honey. The early varieties of pears and apples ripen as well as the black grapes, apricots and cherries.[1]

Although al-Rahman III battled the northern Christian kingdoms' armies whenever they were foolish enough to attack, he did not force Islam upon his people. Christians and Jews could practice their faith freely in Andalusia. This tolerant rule satisfied everyone. In fact, many young Christians and Jews dismayed their elders; they learned Arabic instead of Latin and Hebrew, and "adopted the Arabic culture to such an extent that they became known as *mozárabes* (meaning "Arabized").[2]

We must speak of Cordoba, the historically-important city located on the Guadalquivir River in present-day southern Spain and whose ancient downtown nowadays is a UNESCO world heritage cultural site. Originally a provincial capital, it served beginning in 756 CE as the capital of the Emirate of Cordoba. Dr. Mohamerd Amin Elgohary, in his 2006 paper, "Al-Zahrāwī: The Father of Modern Surgery," published in the *Annals of Pediatric Surgery*, provides us this description of 10th Century CE Cordoba:

> Cordoba was the magnificent capital of Andalusia. Named the "flowering Cordoba," it was one of the wonders of the world. At the zenith of its flowering, Cordoba had a total population of one million living in 200,000 houses. It housed 600 mosques, 900 public baths, 80 schools and 27 high schools, 300 libraries containing 1 million books. The status of a person at that time was gauged by how much he had read and the wealth was measured by how many books he owned.[3]

Baghdad and Constantinople were at the time larger cities population-wise, but Cordoba was "certainly the most advanced of all in its cleanliness, street-lighting and other municipal facilities."[4] Residents of the city, unlike all too many urban dwellers today, did not live in fear. Muggers and other types of thieves found no home in Cordoba, as anyone who tried to assault or steal from a person ended up finding his head on a pike. In short, 10th Century Cordobans who by and large successfully balanced life's three elements—body, mind, and soul—enjoyed a most refreshing quality of life, one which can be said to have far surpassed our own. According to Burckhardt, daily life for the residents of Cordoba went this way:

> People drew upon a spiritual continuity, which only a way of life that is consistent in spirit and form can confer, and for this reason they were both detached and confident in equal measure in their statements—every gesture, every word had a firm, polished form
>
> In their dealings with each other, people were courteous. Heads of families, scholars, and old men were highly respected, and everyone, even the poorest man, had his dignity.
>
> In general, there was no shortage of essential goods, and no one would have thought that mankind had to look to the future for an ideal world. The meaning of life was that it was directed towards the Eternal, and it was just this that gave the here and now its quite unmistakable richness.[5]

It was into this wondrous, prosperous city, with its harmonious, well-centered society, that the next physician whose life we'll investigate was born—a physician whose accomplishments were so unparalleled that one has to think that the ideal conditions of life he enjoyed in Cordoba played an indispensable role in the creation of his achievements.

17. Al-Zahrāwī (Abulcasis)

The Father of Modern Surgery

936 CE witnessed the birth of one of the most remarkable men in the history of medicine, Abū al-Qāsim al-Zahrāwī, who over the centuries has come to be known as The Father of Modern Surgery. He was born in Madīnat az-Zahrā, a once glorious palace-city (whose name literally means "the Shining City") located 5 kilometers west of Cordoba, and which served as the summertime residence of the Umayyad caliphs. As may be apparent, the last part of al-Zahrāwī's name emanates from the name of his birth city, while the medieval Europeans latinized the Abū al-Qāsim first part of his name, calling him Abulcasis.

Unlike many of the physicians whose lives and accomplishments we have examined, al-Zahrāwī was not an Arabized physician, but rather a true Arab physician. Elgohary informs us that al-Zahrāwī's "family descended from Al-Ansar [people from Medina who were supporters of Mohammed] in Saudi Arabia who settled earlier in Spain."[1] A 2015 paper, "Dental Practice in Al-Andalus (Spain) in the 10th and 11th Centuries — Ce: Abulcasis Al-Zahrāwī," authored by Dr. Antonio Lopez-Valverde and 8 co-researchers, states that al-Zahrāwī "learned his trade from his father, Abbas, possibly in order to eventually take on his father's patients. However, there are indications that in his youth he went to Baghdad to complete his knowledge of medicine. This was frequently the case among medical students of the time since Baghdad had one of the most important hospitals in the Islamic world."[2] Lopez-Valverde *et al* do not tell us what the "indications" are that led them to believe that al-Zahrāwī might have spent time in Baghdad early in life learning the medical trade. In any event, if al-Zahrāwī had between the ages of 15 and 20

spent some time in Baghdad, the physicians he would have been in contact with would have been under the influence of Rhazes who had taught most of them.

According to Elgohary, al-Zahrāwī attended the University of Cordoba whose great School of Medicine was rivalled in Europe only by the one in Salerno (Schola Medica Salernitana). Certainly, al-Zahrāwī's father, Abbas, being an established physician, could have afforded to pay for his son to learn medicine in any way desired, be it by attending the local first-class medical school or by spending time in Baghdad, learning medicine from the top physicians there. This is because the services of physicians in 10th Century CE Cordoba were highly valued, leading to a typical Cordoban doctor being richly compensated. Elgohary informs us, for example, that in Cordoba at the time "the annual income of a physician would reach as high as 4.9 million Dirhams when the annual cost of living was 1,000 Dirhams per person. Under these excellent circumstances al-Zahrāwī had practiced medicine."[3] To make these amounts more understandable, 1,000 Dirhams in al-Zahrāwī's day was equivalent to 10.5 ounces of silver. Therefore 1 million Dirhams would have equaled 10,500 ounces of silver, plenty of money for one to have enjoyed a very affluent lifestyle.

Al-Zahrāwī described how he became an outstanding physician this way: "Whatever skills I have, I have derived for myself by my long reading of the books of the Ancients and my thirst to understand them until I extracted the knowledge [they contained] from them. Then through the whole of my life I have adhered to experience and practice."[4] It is clear, though, that al-Zahrāwī, before he ever performed a single surgical procedure on a patient, engaged in a lengthy, rigorous study of the human body, and much of this study likely occurred while he attended medical school at the University of Cordoba. He stated:

> Before practicing, one should be familiar with the science of anatomy and the functions of organs so that he will understand them, recognize their shape, understand their connections, and know their borders. Also, he should know the bones, nerves, and muscles, their numbers, their origin and insertions, the arteries and the veins, their start and end. These anatomical and physiological bases are important, and as said by Hippocrates: "there are many physicians by title, but few by practice." If one does not comprehend anatomy and physiology, he may commit a mistake that can kill the patient. I have seen someone, who pretended to be a surgeon, incise an aneurysm in the neck of a woman, mistaking it for an abscess. The woman bled to death.[5]

It must be pointed out that even though al-Zahrāwī developed into being the most expert surgeon in the world, he favored surgery only as a last resort—only after the patient's adopting a healthy lifestyle, daily consuming nutritional foods as well as, if necessary, simple or compound drugs (which usually were primarily herbal-based) had failed. In fact, one of his two main medical works, a book titled *Liber Servitoris* (translated into Latin by Simon Januensis and Abraham of Tortosa in the 13th Century and published in Venice in 1471), presents instructions on how to prepare from plants, minerals and animals simple and compound drugs. Such was his skill in preparing and then successfully using on patients such drugs that al-Zahrāwī was also known during his lifetime as the "Pharmacist Surgeon." It therefore should come as no surprise that al-Zahrāwī well recognized the dangers entailed in surgery, and repeatedly cautioned against use of the scalpel**. "Surgery**," he maintained, "**should never be undertaken until there is proof that the usual treatments are not effective. Under no circumstances should an operation be performed in desperation, since surgery is only allowable if the condition of the patient makes it likely that the outcome will be successful. If the physician has not recognized the**

nature of the illness beforehand, and has been unable to determine its true cause and still harbors the least doubt in his conscience about it, then it is a crime to attempt an operation, which may endanger the life of his fellowman."[6]

What a contrast between al-Zahrāwī and so many of today's Western allopathic doctors, who order surgery on the slightest pretext! Al-Zahrāwī was right: surgery need *not* be the first resort. The Arab and Arabized physicians, by diligently practicing principles of Preventive Medicine, achieved healings contemporary health care providers might label as miracles. The following story illustrates this proficiency of the Arab and Arabized physicians. In 958 CE al-Zahrāwī, who at age 22 and early in his career served as physician for the Cordoban Caliph Abdul Rahman III, was handed a special assignment. Sancho, the King of Leon, had just been dethroned. Notes the British military historian of the Arab Empire, John Bagot Glubb, "One of the reasons for Sancho's deposition had been that he was so fat that he could not mount a horse."[7] Sancho at first took refuge with his grandmother, the Queen of Navarre (Navarre, Leon, and Castile comprised the three small Christian kingdoms in northern Spain). But, it seems he soon came under the care of al-Zahrāwī. Continues Glubb, "The Queen of Navarre determined to restore him to his throne but was too weak to engage single-handed in war against Leon and Castile. Besides which, it was first necessary to reduce Sancho's obesity to less ridiculous proportions. A deputation was accordingly sent to the court of Abdul Rahman to obtain medical advice, for no competent physician existed among the Christians. In 960 CE Sancho, surnamed 'the Fat,' was restored by Muslim arms to the throne of Leon. Moreover, as a result of the ministrations of the Arab physicians, he had regained the slender waistline of youth."[8]

Along with serving as personal physician to the Caliph, al-Zahrāwī also served in the same capacity to Amir al-Mansur (938-1002 CE), the extraordinary military Commander of the Caliphate who possessed and exercised supreme power in Cordoba. Al-Mansur in 978 CE overthrew the vizier (Prime Minister) and immediately assumed that position of authority. Manning his army with Berbers and mercenaries, he then mounted on an annual basis a series of military campaigns against the Christians in northern Spain, decisively winning so many battles that he was bestowed the honorific title, "Made Victorious by God." Perhaps his most famous battle victory occurred in 997 CE at the great Christian shrine of Santiago de Compostela in northwestern Spain. Five years later al-Mansur died while returning from Castile after conducting his 50th military campaign! How all this relates to al-Zahrāwī is that Dr. Sharif Al-Ghazal, in his August, 2020 paper, "Al-Zahrāwī (Abulcasis) — A Father of Operative Plastic Surgery in Europe," published in the *Journal of the British Islamic Medical Association*, informs us that al-Zahrāwī "apparently travelled very little but had wide experience treating accident victims and war casualties."[9] It can easily be surmised that he gained his significant experience in treating the latter whenever he accompanied Al-Mansur's army as it went into combat. So, how did al-Zahrāwī treat a typical battlefield wound? Al-Ghazal first tells us in brief that the treatment entailed "primary suturing for fresh wounds and debriding healed margins prior to attempted surgical closure," and next provides us al-Zahrāwī's own precise, easy-to-understand instructions on how to properly close wounds:

> If the wound is fresh and bleeding, bring the edges of the wound together with a suture, and dress it till it is healed. If the discontinuity has separated the edges, and both edges have healed, it is necessary to scrape both edges on the external skin until they bleed; then bring the edges together with a suture, and put over the powder a plaster of palm ointment, and leave it bandaged for two or three days.[10]

Upon Abdul Rahman III's death in 961 CE, Al-Hakam II became the new Caliph, and al-Zahrāwī served as his personal physician until Al-Hakam II himself passed away fifteen years later in 976 CE. Although he served as the Caliph's personal physician, most of al-Zahrāwī's working time during his five-decades-long career as a doctor was undoubtedly spent on treating patients, instructing medical school students, researching and inventing new surgical tools, and writing his medical books. In regard to his patients, we are told by Al-Ghazal that al-Zahrāwī "insisted on seeing patients regardless of their financial status."[11] This story is supported by Max Valentinuzzi in his 2016 *IEEE Pulse* paper, "Could Al-Zahrāwī Be Considered a Biomedical Engineer?", who relates that "as an example of his humanity, al-Zahrāwī spent half of his working hours treating patients as an unpaid volunteer."[12] Along these lines, Elgohary states that al-Zahrāwī "devoted his life and lifework to his patients and students,"[13] the latter of whom he frequently and affectionately referred to as "my children," an understandable expression given that there is no record or report of al-Zahrāwī having ever been married or producing any offspring.

A student enrolled in the University of Cordoba's School of Medicine would have learned from al-Zahrāwī more than just how to treat a patient's bodily health problem. Among other things, he would have received this strong advice to not overspecialize as a physician from al-Zahrāwī: "Too much branching and specialization in many fields before perfecting one of them causes frustration and mental fatigue."[14] The student would also have been taught to practice bedside clinical medicine, hearing al-Zahrāwī tell him and his classmates the following: "Only by repeated visits to the patient's bedside can the physician follow the progress of the medical treatment."[15] Maintaining the highest ethical and moral standards, not only as a physician, but also in one's personal life, was another, and perhaps the most important, lesson al-Zahrāwī taught his medical school students, as Al-Ghazal points out:

> Al-Zahrāwī would tell his students and other junior doctors, "Keep away from anything which may negatively affect your reputation in this life and the hereafter, for it is better for you and increases your ranks and pleases your Lord."[16]

By far al-Zahrāwī's greatest accomplishment was one that strongly lived on for hundreds of years after his death in 1013 CE and still today influences how many medical procedures are performed. This accomplishment came about from al-Zahrāwī's dedicating nearly fifty years of his life to researching and writing a 30-volume encyclopedia of medicine titled *Kitāb al-Tasrīf* ("The Method of Medicine"). Campbell informs us that "this work consists of two parts, each consisting of fifteen sections: those on anatomy, physiology, and dietetics are borrowed from Rhazes. The surgical portion of this work was published separately and was the first independent illustrated work on the subject."[17] Completed in the year 1000 CE when al-Zahrāwī was 66 years old, *Kitāb al-Tasrīf* covers virtually the entire field of medicine, such as orthopedics, dentistry, ophthalmology, pharmacology, childbirth, etc. Volume 1 describes general principles of medicine. Volume 2 deals with pathology, while most of the other volumes concern themselves with pharmacology and drugs. However, it is the encyclopedia's last volume, Volume 30, where al-Zahrāwī immortalized himself, a volume which merits our examining it in depth.

Al-Ghazal informs us that *al-Tasrīf's* "last volume, number 30 (which consisted of over 188 chapters) was about surgery. It included over 200 illustrations of surgical instruments, most of which were invented by al-Zahrāwī himself, and explanations of their use. He was the first medical author to provide illustrations of instruments used in surgery; this act alone revolutionized the way in which surgery was taught."[18] The volume's 188 chapters were divided into 3 books,

with the first covering the use of cauterization (burning the skin or flesh with a heated instrument to stop bleeding or prevent a wound from becoming infected), the second dealing with incisions and venous sections, and the third addressing fractures.

Volume 30 assumed such importance and popularity with medical school students and practicing physicians that multiple copies of it were produced under the title *On Surgery and Instruments.* Needless to say, *On Surgery and Instruments* ended up being one of the first medical books authored by an Arab physician translated into Latin. Campbell relates that this book, due in large part to its "lucidity and method of presentation," became "the standard textbook on surgery in Europe for several centuries, being translated into Latin by Gerard of Cremona as early as the twelfth century."[19] He adds that al-Zahrāwī's surgical methods "eclipsed those of Galen and maintained a dominant position in medieval Europe for five hundred years."[20]

According to Elgohary, "al-Zahrāwī was the first to write on orthodontics and describe how to treat misaligned teeth."[21] In fact, of the 188 chapters contained in *On Surgery and Instruments* seven—specifically, Chapters 28 thru 34—deal thoroughly with the field of dentistry. Lopez-Valverde *et al* point out that although in al-Zahrāwī's day "all matters regarding the mouth and teeth were considered secondary within the context of medicine, such fields being relegated to barbers and bleeders, al-Zahrāwī covers everything related to these aspects in seven chapters—from the 28th to the 35th, devoting each one to different aspects related to oral-dental pathology and oral surgery."[22] Let us now take a closer look at some of these seven chapters contained in *On Surgery and Instruments* which are devoted to oral-dental pathology and oral surgery.

Chapter 29. Dental Tartar

Lopez-Valverde *et al* provide the following brief overview of this chapter: "In this section al-Zahrāwī offers a perfect argument that tartar is the main cause of gum inflammation and recommends that it should be removed by a scraping and smoothening of the roots. He describes 14 instruments (*mijrads*) designed by himself for such purposes."[23] They next present al-Zahrāwī's own explanation of how dental tartar should be removed, and from reading this explanation we can see the importance he assigned to this treatment. States al-Zahrāwī:

". . . sometimes, on the surface of the teeth, both inside and outside and below the gums, rough scales are deposited; these are ugly in appearance and are black, green or yellow. This corruption begins to affect the gums, and the teeth enter a state of loss of protection. It is necessary to place the head of the patient on your lap, between your legs, and scrape the teeth and molars in which you see something akin to sand and continue doing this until these substances have been completely removed and the dirty color of the teeth has disappeared, be it black, green, yellowish or any other color. If the first scraping is not sufficient, scraping should be continued on the following day, and—if necessary—a third or even fourth scraping should be performed."[24] [117P]

(Photo courtesy of Fuat Sezgin)

Tooth scraper instruments (*mijrads*) designed and used by al-Zahrāwī

Chapter 30. Cauterization

Al-Zahrāwī describes in this chapter the use of different cauterizing instruments for the removal of soft tissues, such as epulis (a tumor or growth on the gingiva—i.e., the gums—of the teeth). He also employed cautery for the same purpose as the modern electric scalpel is used today, which is to perform gingivectomies (surgical removal of gum tissue).

The cauterizing instruments that al-Zahrāwī used, and recommended that other physicians use, were made of iron, instead of other metals (such as gold). He explained his preference for iron this way: "Iron preserves the heat longer and requires a higher temperature to melt. When iron is red hot, it can be used to coagulate, and when it reaches even higher temperatures goes yellow, it can be used to cut."[25]

As one would hope, al-Zahrāwī emphasized how important it is to protect adjacent structures and tissues when cauterizing with red-hot iron, recommending that after cauterization the patient "should keep her mouth full of a good butter for one hour."[26]

In the case of the treatment of epulis, al-Zahrāwī did not resort to cauterization unless his preferred treatment method failed to achieve a permanent cure. He describes his preferred treatment method as follows: ". . . lift it [the growth] with a hook or hold it with a forceps, cutting it out at its root and allowing the pus or blood to flow out. After closing the wound, astringent powders should be applied. If it grows back, it must be cauterized."[27]

Chapter 32. Extracting Teeth

Al-Zahrāwī regarded the extraction of one or more teeth as a procedure which could not be treated lightly or performed carelessly. Lopez-Valverde *et al* amplify this point, stating:

Al-Zahrāwī counsels prudence when making decisions about molar extraction, "…because it is a noble organ and possession of it cannot be substituted perfectly in any case." Likewise, he warns that great caution should be exercised on deciding which tooth is the bad one since patients, fooled by their pain, often ask for a healthy tooth to be removed instead of the degraded one. "This happens," he notes, "when a barber is the one performing the surgery."[28]

In this chapter al-Zahrāwī provides the following detailed instructions for properly performing the tooth extraction process:

It is necessary to detach the whole of the perimeter of the gum from the tooth with a sufficiently strong scalpel; then, either with the fingers or with a pair of light forceps, the molar should be rocked gently until it becomes loose. Then, the surgeon, holding the patient's head firmly between his knees, should apply a stronger pair of forceps and withdraw the tooth vertically so as not to break it. When the tooth is rotten and empty, the cavity should be filled with small pieces of cloth, tamping them down firmly inside the tooth with the tip of a probe so that the tooth will not break under the pressure of the instrument.

It is crucial not to act like the crazy ignorant barbers, who in their temerity fail to observe any of the rules cited previously and often causes serious wounds in the patient, the least of these being tooth fracture, leaving the root in its place, or pulling a piece of bone from the maxilla together with the tooth, as I have often noted.[29]

In addition to providing the above tooth extraction instructions, Lopez-Valverde *et al* inform us that al-Zahrāwī also "designed several types of forceps and elevators [dental extraction instruments that work on the principle of leverage] for tooth extraction, with one of the forceps, straight and having a swan's beak tip, being ideal for introduction under the gum and for the removal of root fragments."[30] Al-Zahrāwī himself recommended that if the person using forceps in a tooth or root fragment extraction procedure does not succeed, then "he should attempt it with an elevator."[31]

Chapter 33. Supporting Loose Teeth and Replacing Lost Teeth

Dental implants, of course, were not something that the technology of the 10th and 11th Century CE could provide. However, al-Zahrāwī came up with an alternative solution, which may well have worked out fine in many cases, for people with loose or lost teeth. We learn from Lopez-Valverde *et al* that in this chapter al-Zahrāwī "recommended the tying of loose teeth, and even suggested that fallen teeth be replaced, tying them with wire to contiguous teeth to stabilize them. He also counselled that when teeth were lost, they should be replaced by artificial pieces made of ox bone, tying them to adjacent teeth."[32] In the words of al-Zahrāwī:

> . . . they [the loose teeth] should be tied to healthy teeth on both sides, using silver wire, although gold wire is better since it does not oxidize. It is also possible to replace one or two molars, after they have fallen out of their respective places, by constructing the scaffolding we have mentioned and these will remain fast; however, this can only be done by a talented and meticulous craftsman. Sometimes a tooth from a cow is sculpted into the shape of the molar, after which it is placed in the cavity left by the fallen piece and the scaffolding is done as we have described. By doing so it will remain fast.[33]

These chapters in *On Surgery and Instruments* dealing with dentistry and oral surgery were not without influence, as some Muslim Andalusian physicians who followed al-Zahrāwī proceeded to devote significant space in their medical treatises to oral-dental pathologies. We see this occurring most notably with Ibn Zuhr and Averroes in their masterpiece medical books—*Kitāb al-Taysir* by the former and *Kitāb al-Kullīyyāt fi tib* by the latter. However, of all the medieval Arab and Arabized physicians, al-Zahrāwī by far contributed the most to the development of the field of dentistry.

_____ _____ _____ _____ _____ _____

We shall now direct our attention to other surgical procedures covered in *On Surgery and Instruments* as well as to some of the most important "firsts" achieved by al-Zahrāwī. For starters, Elgohary informs us that al-Zahrāwī was the first to:

A) Use cotton in surgical dressings, in the control of hemorrhage and as padding in the splinting of fractures;

B) Describe in detail the unusual disease, hemophilia, and point out its hereditary nature;

C) Use cautery, wax and alcohol to control bleeding from the skull during cranial surgery, and described the ligature of arteries long before the French surgeon Ambroise Paré did so over 550 years later in 1552 CE [note: ligature is the use of a thread or wire during surgery to bind or tie a vessel, generally for the purpose of controlling bleeding; al-Zahrāwī used either catgut or silk as the thread];

D) The first surgeon to describe ectopic pregnancy, which is where a fertilized egg attaches itself outside the uterus; if untreated, it may lead to life-threatening bleeding.[34]

Al-Zahrāwī recorded another first with regard to patellectomy, which is the surgical procedure performed when removing the entire or part of the patella, i.e., the small bone located in the front part of the knee, commonly called the kneecap. His description of patellectomy predates by nearly 1,000 years the reintroduction of this operation in 1937 by the orthopedist, R. Brooke.

Elgohary tells us that al-Zahrāwī "used ink to mark the incisions on his patients preoperatively, which nowadays is a routine standard procedure."[35] And most certainly al-Zahrāwī would have marked areas around the breasts of a patient who was to be operated on for gynecomastia. Gynecomastia is the abnormal, non-cancerous enlargement of a man's breasts caused by a hormonal imbalance between estrogen and androgen. This surgical procedure was no doubt one al-Zahrāwī performed quite a few times, for he wrote an entire chapter in *On Surgery and Instruments* on gynecomastia.

Chapter 47. On Gynecomastia and Breast Surgery

Al-Ghazal provides the following summary of this chapter:

Al-Zahrāwī described the surgical options to treat gynecomastia and recommended the removal of the glandular tissue by a C-shaped incision for large breasts with excess skin and said, "make two incisions so that the edges join each other, then remove the skin and glandular tissue in between and suture the edges of the defect." Remarkably, this technique is still used for such gynecomastia 1,000 years later.[36]

Valentinuzzi adds to the above description of how al-Zahrāwī performed a gynecomastia operation by informing us that 1) "al-Zahrāwī recommended digital pressure and cotton packs to stop bleeding (as hemorrhage was inevitable in gynecomastia surgery)" and 2) "he was the first surgeon to employ styptic powder after a severe gynecomastia surgical treatment."[37] [note: styptic is a substance capable of causing bleeding to stop when applied to a wound] Valentinuzzi next lists the components, along with their health effects, of the styptic powder used by al-Zahrāwī: 1) Dragon's blood [wound healing, antimicrobial], 2) Sarcolla [wound healing], 3) Myrrh [wound healing, antibacterial], 4) Aloe [wound healing, antimicrobial], Gun Arabic tree [antibacterial]. In the case of myrrh, several scientific studies have found that the components of myrrh exert an antibacterial effect. For example, a May, 2000 study, "Local Anaesthetic, Antibacterial and Antifungal Properties of Sesquiterpenes from Myrrh," by P. Dolara and six co-researchers, published in *Planta Medica,* found that two sesquiterpene fractions contained in myrrh "showed antibacterial and antifungal activity against standard pathogenic strains of Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Candida albicans. These compounds had local anesthetic ability, blocking the inward sodium current of excitable mammalian membranes."[38]

This scientific study clearly confirms al-Zahrāwī's wisdom in including myrrh as one of the ingredients in the styptic powder he used when performing surgery. One imagines that few, if any, of his patients who were administered the styptic powder during some surgical procedure developed an infection afterwards. In addition to administering styptic powder to patients he operated on in order to prevent infection, Valentinuzzi points out another anti-infection measure al-Zahrāwī took, which was that he "used alcohol extracted from wine to keep his surgical instruments clean and to make spare tools ready for use in case of emergency."[39]

Now, one would think that a patient of al-Zahrāwī's undergoing surgery for gynecomastia would experience tremendous pain. General anesthesia, after all, is generally believed to only have come into existence in the 1840s when both diethyl ether and chloroform were successfully used in this capacity on patients. However, al-Zahrāwī's patients did not experience tremendous pain during operations. In fact, they experienced no pain or at most very minimal pain. This is because al-Zahrāwī invented and used on his patients a 10th and 11th Century version of general anesthesia, which came to be known in medieval Europe as "Arabian Nights." Valentinuzzi explains this way ahead-of-its-time invention of al-Zahrāwī's:

Al-Zahrāwī developed the anesthetic sponge, which was the precursor to modern anesthesia. Before him, patients were given multiple doses of anesthetic solution during surgery. This predisposed the patients to the risk of overdose. Al-Zahrāwī invented a sponge that was saturated with aromatics and soporifics and then dried. [note: a soporific is a substance which helps induce drowsiness or sleep] At the time for anesthesia, the sponge was immersed in a boiled solution and passed on the patient's lips and nostrils. The boiled solution contained: 1) hashish [mild euphoria], 2) opium [analgesic, narcotic], 3) C-hyoscine [gastrointestinal sensation, pain relief], and 4) Bearded darnel [dizziness, longer sleep]. The ingredients were absorbed by the mucus membranes, causing deep sleep and pain control throughout the surgery. This type of anesthesia, "anesthesia by inhalation," was known in Europe as "Arabian nights."[40]

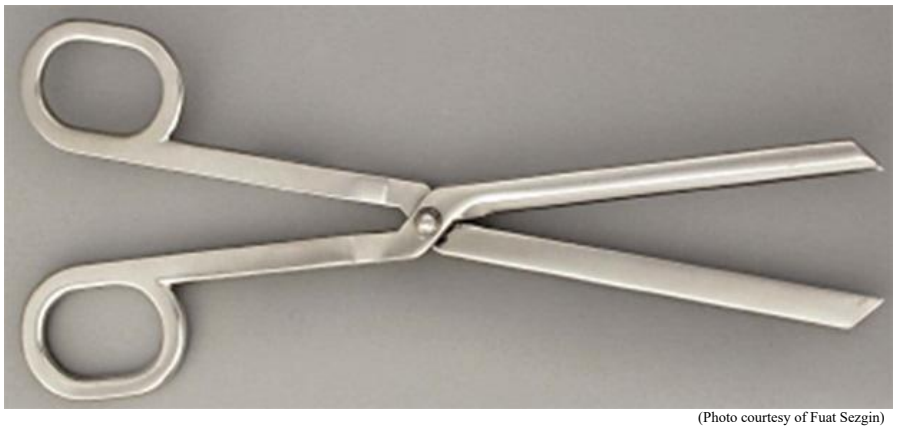
The anesthetic sponge would certainly have been used by al-Zahrāwī on any patient undergoing some sort of surgery on an organ inside the patient's body. But, once the anesthetized patient's body is opened up, what material does the physician use to repair the damaged organ? The reparative material cannot be one that the body rejects, and prior to al-Zahrāwī physicians had not found any such material that the body would accept. However, in observing his pet monkey's excreta one day, al-Zahrāwī became the first person in history to discover and then use in his medical practice the perfect material—animal gut, which is more commonly called catgut. Valentinuzzi describes this discovery:

Al-Zahrāwī was the first surgeon to use animal gut to suture a wounded intestine. He understood that a compatible biomaterial should be used inside the human body so that the body would not reject it. He recognized that animal gut is a dissolvable material after he discovered that a monkey had eaten the strings of his lute; he checked the monkey's excreta but did not find the lute strings. Suture strings are still made of animal gut today.[41]

Varicose vein surgery is another procedure that al-Zahrāwī perfected. His description of how a diseased vein should be stripped closely mirrors the steps that even in modern times surgeons performing this operation have followed:

Have the leg shaved if it is hairy. The patient gets a bath and his leg is kept in hot water until it becomes red and the veins dilate; or he exercises vigorously. Incise the skin opposite the varicose vein longitudinally either at the ankle or at the knee. Keep the skin open by hooks. Expose, dissect and separate the vein. Introduce a spatula underneath it. When the vein is elevated above the skin level, hang it with a blunt rounded hook. At the ankle, ligate and strip it by pulling it from the incision just above. Ligate the vein and then excise it. If difficulty is encountered in pulling it, ligate its terminal part with a string and pass it under the spatula and dissect it further. Pull gently and avoid its tearing because if it does, it becomes difficult to strip all of it and can cause harm to the patient. When you have stripped it all, put alcohol sponges at the sites of the skin incisions and take care of the incisions until they heal. Dissect it and hang it with the hooks and strip it as previously described. Do not tear the vein or injure it. If this happens, it becomes difficult to strip it. The hooks used should be blunt, eyeless, and rounded; otherwise, they can injure the vein.[42]

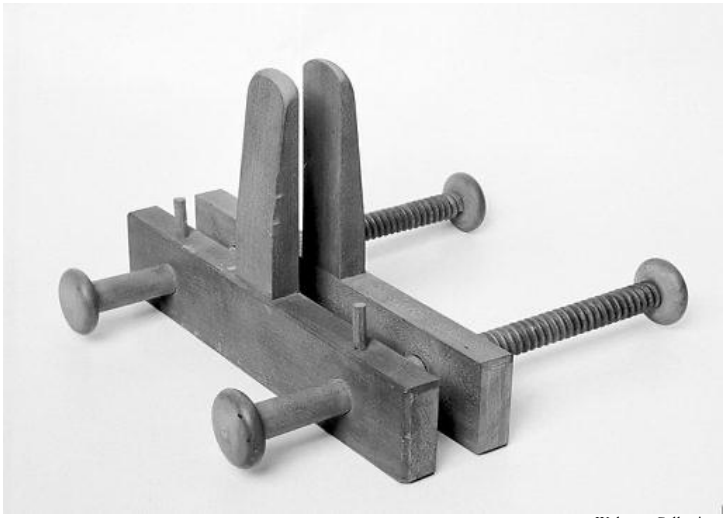
Al-Ghazal tells us that in *On Surgery and Instruments* "circumcision was another surgical procedure that was discussed by al-Zahrāwī, and its description was apt as it was not practiced by non-Muslims before. He wrote also about surgical techniques for circumcision, the instruments used and how it was not advisable to use sedation as well as broadly describing complications."[43] Valentinuzzi indicates that al-Zahrāwī actually invented a new type of scissors for this procedure, stating: "Al-Zahrāwī used specially-designed scissors in the circumcision of boys. The shape of the scissors is flattened, sharp, and straight, with the pivot tempered. The handles and blades of the scissors are equal in length to provide the fingers holding them with the correct sensation. Surgical scissors are an Arabian invention speculated to be by al-Zahrāwī as they were not described elsewhere before his work."[44]



(Photo courtesy of Fuat Sezgin)

Surgical scissors designed by al-Zahrāwī used in the circumcision of boys

Meanwhile, al-Zahrāwī appears at the very least to have improved upon existing designs for a vaginal speculum. Valentinuzzi relates that "al-Zahrāwī used a vaginal speculum to help in the extraction of a dead fetus. The two-blade speculum (dilator) resembles a book press and is equipped with a screw arrangement for unscrewing its spoon-like branches to widen the genital tract. He specified that the branches' lengths should be comparable to the vaginal depth (11 centimeters) or a little more."[45]



Welcome Collection

Wood reconstruction of speculum used by al-Zahrāwī

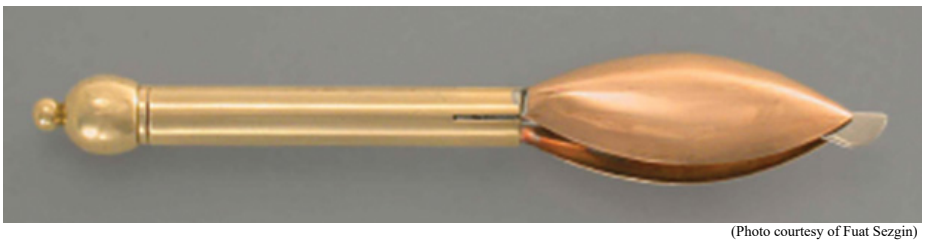
Among the many tools and instruments invented by al-Zahrāwī, a few more merit special mention. To provide some context for the first one we'll look at, one needs to know that three generations of the Chamberlain family of England, whose careers spanned from the late 1500s to 1728 CE, are considered to be the inventors of obstetrics forceps, which are used in childbirth. But, were the Chamberlains the true inventors of obstetrics forceps? Valentinuzzi informs us that "al-Zahrāwī was the first surgeon, before the famous Chamberlain family, to use a cephalotribe, which was a type of crude forceps. The cephalotribe has saw-toothed curved jaws and very strong handles."[46]

(Photo courtesy of Fuat Sezgin)

Cephalotribe (obstetrics forceps invented and used by al-Zahrāwī)

Many people get scared whenever they see their doctor pull out a knife or some other cutting tool in order to perform some sort of surgical procedure on them. Al-Zahrāwī recognized that it is not an ideal situation for either the patient to be scared or for the physician to be working on a fearful patient. He therefore developed a new type of knife to greatly alleviate, if not eliminate, this problem: the concealed knife. Valentinuzzi describes this clever invention:

Al-Zahrāwī invented a concealed knife for incising abscesses, removing tumors and growths, and treating men struck by arrows. The knife is made of copper and consists of a mobile lancet covered by an ellipsoid shell (secret chamber) attached to a handle. The lancet could be drawn out of the shell to the desired length and withdrawn again inside the shell. The knife is connected in that form to deceive the patient (especially a child) and not raise his or her anxiety, and that is clear from its name in Arabic, *mokhdeaa*, which means "the deceiver." Also, this connection serves as a safety procedure for surgeons, decreasing the risk of cutting their own hands.[47]



(Photo courtesy of Fuat Sezgin)

Concealed knife ("the deceiver") invented by al-Zahrāwī

It isn't enough for a physician to determine what the patient's health problem is. The physician also needs to know what medication to prescribe and equally importantly what the dosage of the medication should be. When the medication is a particular herb or a mixture of different herbs, which the Arab physicians regularly prescribed, one can see that there easily could be a problem of ensuring that the patient received and consumed the right dosage. Recalling that many people called al-Zahrāwī during his lifetime "the Pharmacist Surgeon," we should not be surprised to learn that he tackled this problem and came up with the solution: tablets of powdered medicines. As we'll see, he set up a sophisticated tablet manufacturing business, where even the name of the drug was printed on the tablet (the first time in history this had been done).

Valentinuzzi provides us the following detailed account of al-Zahrāwī organizing the manufacture of tablets so successfully that his procedure for making tablets remained the standard procedure followed for several hundred years:

Al-Zahrāwī was concerned with the delivery of the right dose of a mixture of powdered drugs to the patient. He was aware of the suspension property of the powder mixtures that would deliver incorrect dosages. Also, he considered powders less stable than tablets as the former have more surface area exposed to air. Powders are easily penetrated by air, which accelerates their deterioration. Tablets are easier to use while traveling or at home. So, he fabricated tablet molds for single doses of powdered medicines.

The plate used in tablet mold manufacturing was made of hard, smooth wood, ebony or ivory, or a grinding stone. Its length was 9 inches, with a width of 1.5 inches and a thickness of 2 inches. The plate was cut horizontally in two halves and engraved with the intended number of circles on each side in the appropriate size and shape for the desired tablets. Each engraved circle was half the height of the tablet. A mirror image of the relevant name of the tablet was engraved on one side of each mold so the tablets could be easily distinguished from one another. He was the first to print the name of the drug on the tablet. To ensure that the mold would not stick or disintegrate, it was painted with oil before its closure. Al-Zahrāwī added gums (such as acacia and tragacanth) to the tablets as preserving agents. He described the testing procedures required to obtain the exact weight of the produced tablet. The raw material was inserted into the mold while soft. Then, the material was weighed. If it was lighter than the required weight, the engravings were widened. The procedure was repeated until the material reached the desired weight. Al-Zahrāwī used silver foil to store single doses of powdered medicines. He also wrapped single doses of drugs in catgut packs, which were ready for swallowing. The packs would dissolve, releasing the medications inside the stomach. This procedure was unmodified until the creation of modern drug capsules.[48] [note: 2-piece gel capsules didn't come into widespread use until the middle of the 19th Century CE, as the patent for them was awarded to James Murdoch of London in 1847.]

The last section of *On Surgery and Instruments* covers fractures and dislocations. Al-Zahrāwī recommended for a dislocated wrist this corrective measure: "The carpus of the hand is often dislocated. The way of reducing the dislocation is to place the patient's wrist upon a board while an assistant stretches the hand and the doctor applies pressure on it until it goes back."[49] For a dislocated finger, al-Zahrāwī pointed out that the physician could pop it back into place without any assistance, stating, "When one of the fingers is dislocated dorsally or vertically, then extend the finger and thrust the dislocation with your thumb until it goes back."[50]

Al-Zahrāwī with good reason regarded decreased or no grip strength at all as constituting a very serious injury, one that is far worse than a dislocation. Al-Ghazal presents al-Zahrāwī's insights on this matter:

He described decreased grip strength as one of the symptoms of severed tendons, for which successful treatment was unfounded at the time: "If the hand is slackened so that he is not able to grip anything, then you may know that the tendons are either severed or bruised. In this situation there is no method but to strengthen it by cauterization; this sometimes helps but sometimes is of no help at all."[51]

For a broken nose the repair could be performed two ways, depending on how high up on the nose bone the fracture occurred. Al-Zahrāwī explains: "If one of the two upper parts is broken, you should pass your little finger into the nostrils and straighten out the fracture from inside, with your index and thumb of the other hand being outside. If the fracture is in the upper part of the nose and your finger does not reach, it should be evened by means of a probe with some thickness to it. You may pack the nose with fatty dressing, and then apply externally a plaster of white flour and frankincense made into a paste with egg-white; then put on top some soft towel, but do not bind up the nose at all."[52]

We've noted earlier that *On Surgery and Instruments* contained over 200 illustrations of surgical instruments. Most likely al-Zahrāwī, though possibly one of the two Caliphs that he served as court physician to, hired a very good illustrator to create these drawings; and given how well compensated doctors were in Cordoba during the 10th Century CE, as we've also earlier pointed out, al-Zahrāwī would easily have had the money to pay someone to produce the illustrations. For this same reason he also seems to have had no difficulty paying an expert tool-maker to make all his surgical tool inventions as well as paying a mold maker and others to help set up and run his medicine tablet-making operation. The comfortable financial situation al-Zahrāwī no doubt enjoyed would have been facilitated by his reputation as a "doctor's doctor." Elgohary tells us that "during al-Zahrāwī's lifetime doctors used to travel from far away in order to learn from him."[53] If other physicians valued his expertise so highly that they would travel hundreds of miles to see him during a time (the 10th Century) when travelling a long distance was definitely not easy, then one has to believe that affluent people in Cordoba afflicted with some sort of health problem would have clamored for his services, often offering quite a large sum of money for him to take on their case.

For the first 73 years of his life al-Zahrāwī, residing and working in prosperous, peaceful Cordoba, lived under ideal circumstances—circumstances which permitted him to research and write his 30-volume medical encyclopedia (*Kitāb al-Tasrīf*), invent all sorts of surgical instruments, as well as train innumerable medical school students and practicing physicians. All this changed in February, 1009 CE when a revolution broke out in Cordoba during the reign of Caliph Hisham II. The revolutionaries proclaimed a rival as the new caliph, and a lengthy civil war ensued throughout all of Al-Andalus. Four years later in 1013 CE, the year al-Zahrāwī died at age 77, North African Berbers entered Cordoba and sacked the city. Though the cause of al-Zahrāwī's death is unknown, he easily could have been slain by the attacking Berbers, a manner of death similar to the one inflicted two centuries later in Herat on al-Samarqandi by the Mongols.

In looking at al-Zahrāwī's career, we are struck by his integrity. For example, Al-Ghazal relates the following commendable position al-Zahrāwī took in regard to advanced cancer:

> Al-Zahrāwī stated that if the tumor is large and at an advanced stage it would indicate that surgery is not a suitable option and once said, "I could not cure any patient with advanced cancer," which underlined his wisdom and judgment that an "operate at all costs" mentality is not the right approach and you should only try to perform surgery on operable cancers.[54]

Along these lines, Al-Ghazal adds that al-Zahrāwī "taught his students to know when to operate and when not to operate, as knowing the difference could prevent malpractice."[55]

We are, of course, also struck and impressed by al-Zahrāwī's numerous medical instrument inventions, so many of which continue to be in use worldwide today. In fact, the answer Valentinuzzi provides to the question he posed in his 2016 paper indicates that al-Zahrawi could rightly be called **The Father of Biomedical Engineering**. Explains Valentinuzzi:

> The answer to the question "Could al-Zahrāwī be considered a biomedical engineer?" is certainly "yes." Al-Zahrāwī's contributions involve a variety of biomedical engineering fields. His surgical instruments represent the biomechanics field. The use of catgut in surgical suturing is an example of his contributions in the biomaterials field. The fabrication of tablets represents his contribution to the chemical engineering field. He represents a special model for the interaction between the biomechanical engineer and the physician in the same person.[56]

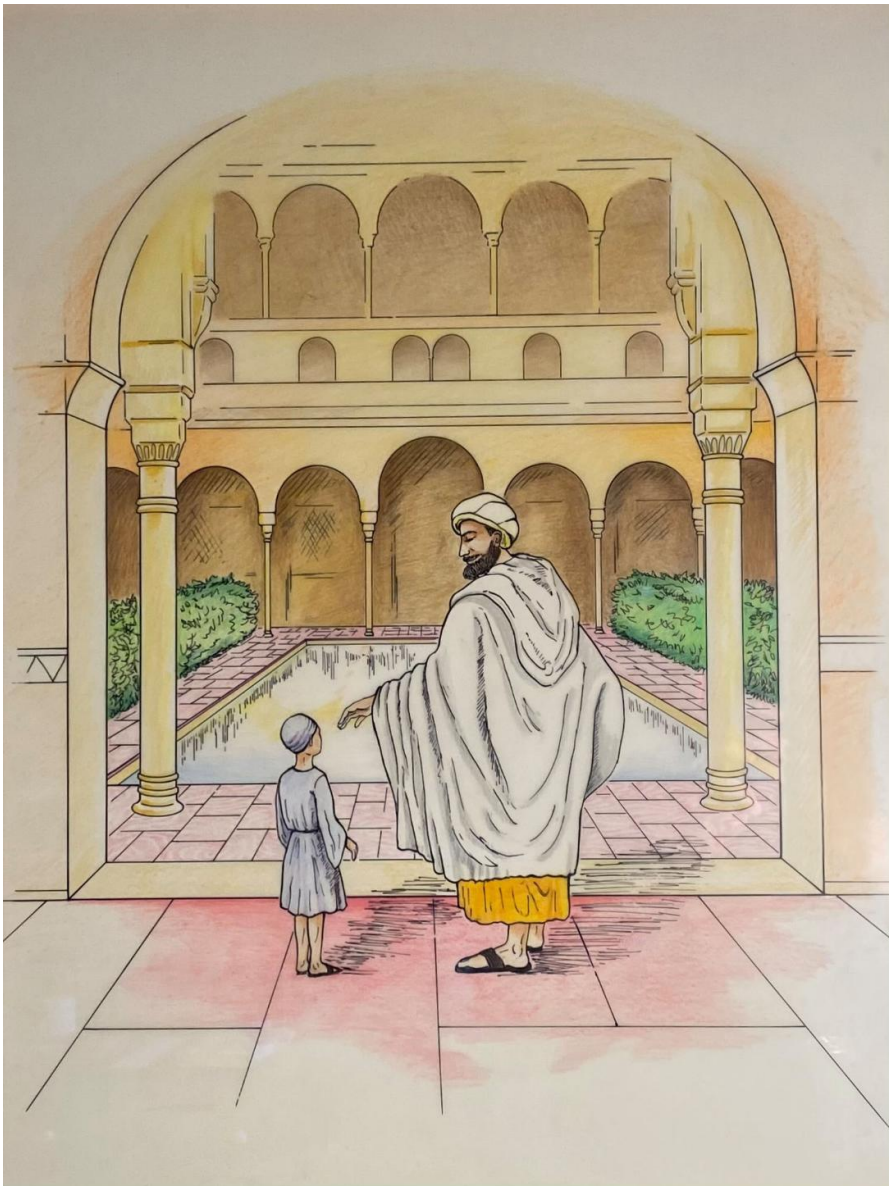
Finally, we are struck like the medieval Europeans were by the enormous quantity of extremely helpful, and often first-ever published, medical/surgical information and illustrations contained in al-Zahrāwī's 30-volume encyclopedia, *Kitāb al-Tasrīf*. The French surgeon Guy de Chauliac in his book, *Great Surgery*, completed in 1363 CE, quoted from *Kitāb al-Tasrīf* over 200 times, and summed up the opinion surgeons like himself had of this work, stating, **"It was nothing less than the greatest achievement of medieval surgery."**[57]

Quite a legacy Abū al-Qāsim al-Zahrāwī left for us.

18. Abū l-‘Alā’, “The Wizard of Al-Andalus,”

and his famous physician son

Ibn Zuhr



The young Ibn Zuhr with his physician father, Abū l-‘Alā’, in one of the inner courtyards of the Alcázar, the fortress-palace in Seville

As the old saying goes, behind every successful person is a father and mother. This certainly holds true for Ibn Zuhr, who is generally regarded to have been the greatest physician Muslim Spain produced, and whose books and discoveries enormously advanced the field of medicine in medieval Europe. And so we must first look at the life and accomplishments of Ibn Zuhr's father, Abū l-'Alā', in order to see what impact and influence these had on his son's life.

Although it is not completely clear, Abū l-'Alā', whose full name was Abū l-'Alā' Zuhr ibn 'Abd al-Malik, was likely born in Seville in 1060 CE. His own father, Abū Marwān 'Abd al-Malik, had been a well-regarded physician. Henry Azar, in his book, *The Sage of Seville: Ibn Zuhr; His Time and His Medical Legacy*, informs us that after receiving a thorough education in the Koran and *figh* (Muslim jurisprudence) Abū Marwān "traveled east for the pilgrimage of Mecca and studied medicine en route, presumably in Kairouan, the center of learning in North Africa. He spent a considerable time in Egypt and possibly in Baghdad practicing medicine. When he returned to Spain, he settled in the Mediterranean port city of Denia, south of Valencia, where he acquired wide fame as a physician. Abū Marwān served Mujāhid (d. 1045 CE), the ruler of Denia and one of the Ta'ifa petty kings, throughout his rule. This king, the son of a Christian woman but a devout Muslim of Slavic origin, was a man of wide erudition who attracted to his court some of the best talents of his time and rewarded them generously. After the death of Mujāhid, Abū Marwān moved to Seville, where he died in 1078 CE, leaving a vast fortune."[1]

Thanks no doubt to his father's affluent financial condition, Abū l-'Alā' had no difficulty moving from Seville to Cordoba, living in that city while furthering his education. Professor Luisa Cambra, in her 2019 paper, "Abū l-'Alā' Zuhr, The Quack of Al-Andalus," relates that when Abū l-'Alā' "was young, he moved to Cordoba where he met Abū 'Ali al-Ghassānī, who taught him in the Great Mosque and advised him to study the science of hadith [a collection of traditions containing sayings of the prophet Mohammed which constitute the major source of guidance for Muslims apart from the Koran] together with Abū Bakr Ibn Mufawwaz, Abū Ja'far Ibn 'Abd Al-'Aziz and Ibn Ayyub, receiving in this subject (the hadith) a careful education and accurate training. He is also remarkable for cultivating *adab* (belles lettres) and even was in correspondence with Al-Harīrī, the well-known author of maqāmas [the Arabic literary genre which alternates Arabic rhymed prose with intervals of poetry in which rhetorical extravagance is conspicuous]."[2] At this point in time—the 1070s and 1080s CE—Cordoba had experienced decades of prosperity and peace, ideal conditions for any student to pursue and become proficient in his or her interests.

It was most likely in his late teenage years that Abū l-'Ala' changed course, apparently on the urging and recommendation of his father, for Azar notes that "he started practicing medicine when he was an adolescent," with this taking place in Seville where Abū Marwān conducted his medical practice.[3] Importantly, Abū l-'Ala's new profession as a physician began during the reign of the third Emir of the Principality of Seville, Muhammad al-Mu'tadid (r. 1069-1091 CE). Al-Mu'tadid, besides making his principality the most powerful one in Al-Andalus, also turned Seville into a major cultural center. Working and residing in such a stimulating city probably facilitated Abū l-'Ala's ultimate development as an author of several medical books and treatises. Indeed, Azar points out that Abū l-'Ala' later on not only "became known as a great physician and powerful vizier [but] was also a distinguished writer and poet."[4]

One of Abū l-‘Ala’s most notable diagnostic talents, according to Azar, “was his ability to figure out ailments of patients by observing their urine or feeling their pulse.”[5] He may have acquired this expertise from his father, for Cambra informs us that “he used the teachings of his father, Abū Marwān” in his medical practice.[6] Cambra adds that Abū l-‘Ala’ “also employed a method which was introduced in medical practice among the Ancients: it consists of inquiring into the patient’s antecedents as well as his ascendancy and living conditions. He had an extensive knowledge of both Ancient and Arabic medicine, and he used in his therapeutics the remedies suggested by the classical tradition, but also made use of rare remedies (*nawādir*).”[7]

Before examining the medical works Abū l-‘Ala’ authored, we need to better understand his imperfect personality, for one aspect of it ended up dramatically effecting the life of his son, Ibn Zuhr. The following incidents involving Abū l-‘Ala’ help us realize why one day he is said to have spoken an “unfortunate word” to the wrong person—the Emir. Relates Azar:

He seems to have been a very proud and jealous man, sharp with his tongue and pen. When a merchant brought from Iraq a copy of Avicenna’s *Canon* and presented it to Abū l-‘Ala’, the latter is said to have deprecated it after perusing it. He did not add it to his library, but cut out pieces from its margins so as to write on them prescriptions. This behavior may have been caused by professional jealousy. Or, he may have believed that Avicenna, his rival from faraway Persia, was just a compiler of books with no deep knowledge of medicine.

Ibn Abī Usaybi’a also reported that after Ibn Manzur, *qādī al-qudāt* (chief justice) of Seville, sarcastically remarked that Abū l-‘Ala’ had fallen sick, the latter retaliated with the following verse:

> They said Ibn Manzur was amazed I was ill;
> I say the one who walks also stumbles.
> Galen used to frequently fall sick.
> Is it so unusual for a jurist to be bribed?[8]

If you are beginning to think that Abū l-‘Ala’ seems to have had a knack for making enemies, you would be correct. One can easily see that Ibn Manzur would have been angered over Abū l-‘Ala’s publicly-issued insinuation that he was a crooked, bribe-taking judge, even if the accusation were true.

In 1085 CE a Christian army from northern Iberia conquered Toledo. This serious setback for the Muslims compelled Al-Mu’tadid, who feared that his soldiers could not prevent the Christians forces from capturing more cities and provinces in Al-Andalus, to seek the assistance of the Berber Almoravids. The Almoravids were a Muslim Berber dynasty which controlled most of northwest Africa (from Mauretania northwards through Morocco and into western Algeria). Founded in the 1050s CE this dynasty, seeing an opportunity to expand its empire, readily accepted Al-Mu’tadid’s invitation. Accordingly, an Almoravid army under the command of Yūsuf Ibn Tāshufīn crossed the Strait of Gibraltar, entered Al-Andalus and in 1086 CE decisively defeated a coalition of Castilian and Arogonese armies in the Battle of Sagrajas. After this triumph, Ibn Tāshufīn decided not to return Al-Mu’tadid to power, but instead to become himself the new Emir of Al-Andalus; by 1091 he had accomplished this, exiling Al-Mu’tadid to Morocco, and having his army occupy all the country’s major cities, which thereby enlarged the Almoravid Empire to its greatest extent ever.

Now, this change in leadership in Al-Andalus ended up proving to be a pivotal moment in the history of medicine, for Azar reports that “Abū l-‘Ala’, like many Arab aristocrats, rallied to

Yūsuf Ibn Tāshufīn."[9] This astuteness on the part of Abū l-'Ala' to side with a winner paid enormous dividends for him, as Ibn Tāshufīn, impressed with Abū l-'Ala's learning and loyalty, appointed him to serve as his vizier. Turning out to be an extremely effective and politically-savvy administrator, he successfully occupied this powerful position for over thirty-five years, spending most of his work time in the Alcázar, Seville's fortress-palace. Meanwhile, the Christian Europeans, respecting, though probably not at all liking, his ability to help the Almoravids maintain continuous Muslim control over Al-Andalus, referred to him by two latinized names, calling him either Alguazir Albuleizor or Abuleli. Eventually, Ibn Tāshufīn at the age of 100 years died in 1106 CE; how much his longevity was owed to any dietary and lifestyle advice he might have received from Abū l-'Ala' we do not know; in any event, his son, 'Ali, became the new Emir and retained Abū l-'Ala' for many more years as his vizier, too—all the way up to the fateful day, which we'll discuss later, when the latter spoke his "unfortunate word" to his boss.

The Almoravid Empire in comparison to modern-day borders

As mentioned earlier, Abū l-'Ala' authored many medical books and treatises. Thanks to the fortune his father, Abū Marwān, left him, as well as the substantial income he himself undoubtedly earned as a physician and later on as the Emir's vizier, he would have been able to afford to set aside the time necessary to write these works. Historians have not provided us the year in which each of these works was produced. However, we can approximate with a decent amount of accuracy when one of Abū l-'Ala's most significant books appeared. This book, *Kitāb al-Tadhkira* ("Book of Mementos"), was written for his son, Ibn Zuhr, who while still an adolescent had been administered the Hippocratic Oath by his father. As Ibn Zuhr's first and most influential teacher of medicine, Abū l-'Ala' probably thought it wise to substitute his son for himself as the physician on a job request that had come in from Morocco. Ibn Zuhr, who had been born in Seville in 1092-1094 CE, was still young at the time, probably 18 to 20 years old, and so working as a physician in Morocco would provide him excellent on-the-job training. To help his son succeed in this endeavor, he gave him a copy of *Kitāb al-Tadhkira* to refer to, if necessary, while treating patients. Azar states that this book, which likely was written sometime between 1110 and 1114 CE, is composed of "some principles of diagnosis and therapy."[10] And, one of the

principles Abū l-'Ala' emphasized was for the physician to always be very cautious in deciding whether or not to administer a strong purgative to a patient, explaining his reasoning as follows:

A physician represents a man; a purgative, a house full of flax. When the man enters it carefully with an oil lamp, he is likely to come out safely without burning the house. Should he enter it with arrogance, mockery and complaisance, the house would be far from secure. I swear to you by God that so far I have never prescribed a purgative without worrying about it for days before and after I prescribed it. These are poisons. What is to be said about the one who prepares the poison and gives it to drink, hoping it will be beneficial, without seeking the help of God Almighty with prayers and for salvation?[11]

Now, some of the common health problems Abū l-'Ala' mentions that his son will encounter while in Morocco are: diarrhea (due to impure water), upper respiratory colds and excessive coughing (due to the region's dry air), and hemorrhoids (due to dehydration causing constipation, as well as the dry air conditions). Most importantly, beginning each paragraph in *al-Tadhkira* with the Arabic word *tadhakkar* ("remember that"), Abū l-'Ala' advises his son how to go about treating each illness. Cambra describes the essence of this advice:

Opposite to the doctors of that time, whom Abū l-'Ala' accused of using remedies without sufficient precautions, he recommended moderation and prudence in the treatment. In the framework of the medicine of the humours and a therapeutics based on the qualities of the remedies (cold, hot, dry and humid) and their degrees, he shows us the damage it could cause to take a drug in an overdose as that could lead to a disorder in inverse order. According to Abū l-'Ala, the corrective strength of the medication must be proportional to the pathogenic tendency; and this means that it is necessary to test in the patient the simple remedy or the composite one, using the one or the other in accordance with the principle of the first degree. Later and depending on the results obtained, the physician can increase the strength in progressive development.[12]

Al-Tadhkira's alternate and lengthier title is *Kitāb al-nuqat al-tibbiya* ("Book of Medical Principles"). Abū l-'Ala's belief was that if one followed his book's guiding principles (*nuqat*) one would become an expert physician; and, of course, the one person he hoped most of all would follow the medical principles he set forth in *al-Tadhkira* was his son, Ibn Zuhr. We'll see soon enough if Ibn Zuhr disappointed his father or instead made him proud; but, for now the following summary by Azar of *al-Tadhkira* and what the book reveals about Abū l-'Ala' merits our attention:

The *Tadhkira* is written simply and is, in places, eloquent. The author's articulation of Galenic therapeutic principles leaves little doubt that he was a well-read and confirmed dogmatist. The book depicts a careful and highly ethical clinician, unusually perceptive about the danger of powerful drugs. He stresses professional responsibility. It is the writing of a father to his promising son. As such, it is a valuable book.[13]

Abū l-'Ala' authored two other important medical books and others of lesser importance. Among the latter he wrote:

Kitāb al-adwiya al-mufrada ("Book of the Simple Medicaments")

Jamī' asrar fi l-tibb ("Collection of Medical Secrets")

Al-wasīyya ("The Recommendation")

Hall shukuk Al-Rāzi alā kutub Jālinus ("Book of the Resolution of Rhazes' Doubts About Galen's Writings")

Maqala fi-radd 'ala Abi Ibn Sina fi-mawadi' min-kitabihi fi l-adwiya al-mufrada ("Treatise of the Refutation of Avicenna's Book of the Simple Medicaments")

Maqala fi-bashti li-risala Ya'qub Ibn Ishaq Al-Kindī fi-tarkib al-adwiya ("Treatise of the Commentary to Ya'qub Ibn Ishaq Al-Kindī's Epistle of the Composition of Drugs")

Before reviewing Abū l-'Ala's next important book, *Kitāb mujarrabāt al-khawāss* ("Book of the Experience's Facts and the Animals' Peculiarities"), we need to understand that two different currents of medical science existed in the Middle Ages. The first current—the classical one—originated from the Greek tradition, and *Al-Tadhkira* represents this current. The second current was one that had been well rooted for eons amongst the masses worldwide. Commonly called folk medicine, Cambra refers to it as "quackery" and defines its attributes this way:

> Quackery or folk medicine is meant to be the technique which bases its therapeutics mainly on magic, sorcery and witchcraft with the use of talismans, amulets, lucky charms and other wonderful remedies such as singular drugs, potions, concoctions and cooking of amazing, astonishing and stunning properties for the cure of diseases; and also rites and rituals. Not lacking in these practices, the master formulas.[14]

Turning to *Kitāb mujarrabāt al-khawāss* itself, Cambra states that the book "is structured according to Arabic alphabet letters, so that each element of Nature (animal, vegetable or mineral) appears in the chapter of the letter with which its Arabic name begins. However, in spite of having a big dose of quackery, this book is enriched with a lot of references to Ancient and Arabic authors, or those who wrote in the Arabic language—such authors, for example, as: Hippocrates, Dioscorides, Aristotle, Plato, Galen, Democrito, Ptolomeo, Pithagoras, Ibn Māsawayh, Ibn Masarjawayh, Qusta Ibn Lūqā, Hunayn Ibn Ishāq, Al-Rāzi and Al-Jāhiz. So, we can conclude that Abū l-'Ala' was an expert in both Greek and Arabic scientific knowledge."[15]

Two of the treatments recommended in this interesting work, which nowadays would be categorized as quackery, are:

Goat horn — For difficult parturition (childbirth): Hang over the left thigh of parturient the right horn of a goat, which will lighten [and make easier] the parturition.

Falcon — If a woman takes falcon stool mixed with syrup, she will get pregnant, even if sterile.

Let's now look at this next treatment recommendation contained in *Kitāb mujarrabāt al-khawāss* and decide if it's just quackery or instead is something that would actually work:

Henbane — If a bit of henbane is hung over one sick of colic, the patient will heal and will succeed in everything. [Note: colic is severe, often fluctuating pain in the abdomen caused by intestinal gas or obstruction in the intestine.]

First of all, we are informed by Dr. Meenakshi Chauhan on the Planet Ayurveda website that henbane, whose scientific name is *hyoscyamus niger*, possesses many therapeutic properties, such as being antispasmodic. Chauhan next explains that henbane "is a natural agent that can block the action of the neurotransmitter acetylcholine in the brain, thereby making it useful in treating diseases like gastrointestinal cramps," and also "can provide relief from gas in the alimentary tract (colic or flatulence or griping)."[16] So, it appears quite possible that a person battling colic who smells the fragrance emitted by the henbane that is hanging above him will experience a complete recovery. The problematic contention made by Abū l-'Ala' is the one where he states that the patient, after healed of his colic, "will succeed in everything." On the surface this claim seems preposterous. But, keep in mind that Abū l-'Ala' may have made this claim, not because he himself actually believed it, but rather because he wanted to instill in the patient a positive mindset and

motivate the patient to follow the henbane recommendation as directed. You see, a major problem physicians face is getting their patients to take and carry out their prescriptions (such as "take 3 pills/day for two weeks," etc.) as directed. Indeed, Trisha Torrey in her March 31, 2023 article, "Why People Are Noncompliant with Treatment," published on the Verywell Health website, points out that "according to the US Centers for Disease Control and Prevention, 50% of prescriptions given annually to patients in the US are not taken correctly."[17] And, probably noncompliance regarding the taking of prescriptions correctly was a problem Abū l-'Ala's patients presented him all the time. So, his telling a patient a little white lie, such as "you will succeed in everything once you are healed," in order to motivate his patient to take the prescription as directed, is commendable; and, as far as a patient is concerned, once the patient has gotten over his affliction, especially a painful one that he's dealt with for quite a while, he very easily may feel that, thanks to his restored-to-good-health life, he is, in fact, succeeding in everything, just as his doctor, Abū l-'Ala', had told him would happen.

The last major medical book Abū l-'Ala' wrote, *Kitāb al-mujarrabāt* ("Book of Tried Medications"), is really a posthumous work. Azar explains that "this book is a compilation of 340 brief notes dictated by Abū l-'Ala' to his disciple Abū 'Āmir ibn Yannaq al-Shātibī, who is better known as a poet than as a physician. According to Ibn Abī Usaybi'a, these notes were collected by order of the Almoravid 'Ali in 1132 CE, soon after the author's death. The book briefly mentions medical conditions (not case histories) affecting various parts of the body from head to toe, and provides recipes for each one of them."[18] Azar adds that only very rarely, less than 1% of the time, does one encounter in this book the kind of fantastical prescriptions that frequently appear in *Kitāb al-mujarrabāt al-khawāss*. Instead, Azar notes that "most of the prescriptions of Abū l-'Ala' fall into the categories of simple and compound medications, and dietary recipes," with the most often prescribed medications being "for ailments affecting the eye, mouth, ear, nose, air passages and lung, liver, stomach, urogenital organs, and skin conditions."[19] Galen is the predecessor quoted the most by Abū l-'Ala', and unless a recommended treatment's recipe is not attributed to him or cannot be traced to him or any other physician, then the recipe should be understood to be one original to Abū l-'Ala'; hence, most of the book's recipes are likely ones he created or are ones his father, Abū Marwān, handed down to him.

Late in Abū l-'Ala's life the attacks on him by his personal enemies intensified, ultimately leading to his dismissal as 'Ali's vizier. Azar tells us that "because of his many detractors and enemies, it is difficult to pinpoint the reason for his downfall. An intense rivalry existed between Abū l-'Ala' and another of 'Ali's personal physicians, Abū Hasan Sufyān. Ibn Bājja (Avempace), a distinguished 12th Century CE polymath, also sharply criticized Abū l-'Ala', whom he utterly despised:

> Oh Master of Death and Ibn Zuhr,
> You both surpassed limits and ends.
> Have a little pity on mankind.
> One of you is enough![20]

Recalling Abū l-'Ala's sharp tongue and proud nature, we cannot be surprised over Azar's description of how the matter finally came to its seemingly inevitable head:

An influential court official, Fath ibn Khāqān, wrote a long letter to 'Ali denouncing Abū l-'Ala' as someone who caused harm to many and could hurt the emir himself. As to further an already acute situation, Abū l-'Ala' is said to have uttered an unfortunate "word" which 'Ali greatly resented.

Consequently, the emir ordered all types of harmful measures against the Ibn Zuhr family, including the beating of Ibn Zuhr and his banishment to Morocco.[21]

We do not know what the "unfortunate word" was that Abū l-'Ala' said to 'Ali, nor do we know exactly the year in which his dismissal as vizier occurred. However, we do know that Abū l-'Ala' died in Cordoba in 1130 CE, and Tchanz estimates that it was in 1131 CE that Ibn Zuhr, "possibly at the death of his father [Abū l-'Ala'], fell out of favor with the Almoravid ruler, 'Ali, and fled to Africa."[22] So, perhaps Abū l-'Ala's downfall occurred in 1129 CE or the next year when he died. It appears that Abū l-'Ala' did not immediately resettle in Cordoba upon 'Ali's firing him from his job as vizier. Ibn Zuhr relates that 'Ali, angry over what Abū l-'Ala' and others had told him "blamed my old father (God have mercy on him). He ['Ali] ordered that he be avenged in every possible manner." Part of 'Ali's vengeance included his imprisoning Ibn Zuhr in Marrakesh, and while in prison the latter "asked about what happened to my father and son. I was told they were both taken away, presumably to the coast."[23] If this account is true, then Ibn Zuhr would have felt 'Ali's wrath before 1131 CE and Abū l-'Ala' would have been taken under guard somewhere, spending time at some place other than Cordoba.

Although we lack precise details on the above matters, we do know with certainty what caused Abū l-'Ala's death. It was from what Ibn Zuhr called a *naghla*—what present-day dermatologists call basal cell carcinoma (skin cancer)—that had grown quite large on his back. Ibn Zuhr, in his masterpiece book whose short title is *Kitāb al-Taysir* ("The Book of Facilitation") discusses among many things three different cases of cancer, with one of the cases being about the cancer that killed his father. The section in the book pertaining to the cancer Abū l-'Ala' was afflicted with is entitled "On Senile Verrucae" [i.e., seborrheic keratosis]. We read in the 2015 paper, "Avenzoar's (1091 – 1162) Clinical Description of Cancer," by Marianna Karamanou *et al*, the following:

> Concerning this disease, Avenzoar mentions: "Skin tumors seen on the shoulder region of the elderly could become profound. That kind of tumor was seen also in my father." According to Avenzoar, these tumors can have a variable volume from a lentil to a bean, and they usually are located on the shoulder region, on the chest or back. The cancerous degeneration is rare, but it can be observed in patients who experience worries, anxiety and sorrows. These senile verrucae correspond to seborrheic keratosis (SK), a common benign epithelia neoplasm that usually affects middle-aged and older patients. However, in rare cases basal cell carcinoma may arise within SK.[24]

Although Abū l-'Ala' died in Cordoba, he was buried in Seville, outside the city's Fath (Victory) Gate. Should you visit his burial place, you will see that he has left this sobering message for you, as his epitaph reads:

Have mercy you who is standing up;
Look down at the place I am buried in.
Dust covers the slab of my tomb
As if I never walked this way before.
I took care of people shielding them from death.
I have in turn become hostage to it.[25]

So, where do we place in the history of medical science this unique man, whose epitaph's message to the reader essentially means "you're going to die some day, too?" For his skillful,

occasional blending of folk medicine with conventional science-based medicine, Cambra calls Abū l-‘Ala’ the “Wizard of Al-Andalus.” She goes on to point out that “Abuleli [i.e., Abū l-‘Ala’] is an example of the high scientific level reached by Arab and Islamic medicine in the Middle Ages. He symbolizes the two currents existing in medieval Arab medicine: the scientific, which they inherited from Antiquity (mainly the Greeks), and the popular characterized by having a big dose of quackery, like his work *Kitāb mujarrabāt al-khawāss* shows. Abuleli for this reason is set in a very outstanding place in the history of universal science.”[26]

Ultimately, though, Abū l-‘Ala’ contributed the most to the progress of medicine through the excellent teaching and solid foundation he provided his son, Ibn Zuhr, in the field, as Ibn Zuhr developed into being the greatest clinical physician Al-Andalus ever produced.

19. "The Wise and Illustrious" Ibn Zuhr, The Father of Experimental Surgery

The greatness of Ibn Zuhr, whose full name was Abū Marwān ʻAbd al-Malik ibn Abū l-ʻAla' ibn Zuhr and who the medieval Europeans called Avenzoar, quickly reveals itself in the following story and the two subsequent positions Ibn Zuhr held with respect to patient care:

{1} In 1120 a Muslim doctor was en route to see his patient, the Almoravid ruler of Seville. On the side of the road he saw an emaciated man holding a water jug. The man's belly was swollen, and he was in obvious distress.

"Are you sick?" the doctor asked the man. The patient nodded.

"What have you been eating?"

"Only a few crusts of bread and the water from this jug."

"Bread won't hurt you," said the doctor. "It could be the water. "Where are you getting it?"

"From the well in town."

Ibn Zuhr pondered a moment. "The well is clean. It must be the jug. Break it and find a new one."

"This is my only jug," whined the man, "I can't."

"And that thing bulging out there," sternly replied the doctor pointing to the man's midsection, "is your only stomach. It is easier to find a new jug than a new stomach."

The man continued to protest, but one of Ibn Zuhr's servants picked up a stone and smashed the jug. A dead frog flowed out with the foul water.

"My friend," the doctor said to the patient, "look what you have been drinking. The frog would have taken you with him. Here, take this coin and go buy a new jug."

When the doctor passed by a few days later, he saw the man sitting on the side of the road. His stomach had shrunken, he had gained weight and his color was back. Seeing the doctor, the man heaped praise of him.[1]

{2} Ibn Zuhr's depth of knowledge and insightfulness is also indicated by how he regarded his patients. To him each one constituted a special case, which is exactly what Preventive Medicine stresses. One situation Ibn Zuhr explained like so: "There are some laxative drugs that have

absolutely no effect on certain individuals yet, paradoxically, a medication that is much weaker and feebler than the aforementioned drugs might influence these same individuals."[2]

{3} But, it is by studying the high standards of practice Ibn Zuhr kept that we come closest to discovering the true greatness of the man, at least in the eyes of his patients. He once stated, **"If a patient falls into a state of collapse without the physician knowing until it occurred and without his having predicted it, then this physician is undoubtedly responsible for the patient's death."**[3] In other words, Ibn Zuhr was willing to accept full responsibility for the death of any of his patients who, for example, died unexpectedly from a heart attack. You will not find many doctors today willing to accept even a fraction of the responsibility Ibn Zuhr assumed. What Ibn Zuhr's stance implies is that he had his patients on such sound dietary regimens and health programs that no unexpected deaths occurred!

In order to understand how Ibn Zuhr came to possess his remarkable expertise as a physician, we need to backtrack some. Born in Seville around 1090-1091 CE Ibn Zuhr received a solid education as a youth, initially studying Islamic Law, theology, and literature, like his forebears. He next spent a certain amount of time studying these topics and possibly medicine as well at the University of Cordoba, with its outstanding School of Medicine, for Tchanz informs us that "after graduating from the University of Cordoba, and a brief stay in Baghdad and Cairo, he began his medical practice and training under his father, Abū l-'Ala'."[4] Assuming Ibn Zuhr was around 18 years old when he visited Baghdad, he would have been there when Hibat Ullah, "the Hippocrates of the Age," was physician-in-chief of the prestigious 'Adudi Hospital which, besides treating patients, also served as a medical school. Possibly the two met, and one has to think that while in Baghdad Ibn Zuhr visited the city's "House of Wisdom" library and research institution, with its thousands of medical texts. In short, it can easily be seen how such a visit could have proven highly educational and inspirational to a young person about to enter the medical profession and why Abū l-'Ala' organized the trip for his son.

Probably not long after his return from Baghdad and Cairo to Seville, Ibn Zuhr became the physician to the ruling Almoravid princes, with this occurring perhaps on the recommendation of his father, Abū l-'Ala' who was serving, as we recall, as the Emir's powerful vizier. Acting in this capacity, he would have become wealthy, like his father and grandfather had become. Indeed, once Ibn Zuhr became well established, according to his biographer, Hāfiz Abū-l Khattāb Ibn Dihya, "he enjoyed high favor under the sovereigns of the West; his family was ancient, his wealth great and his possessions ample."[5]

Given that one important role model aspect of Abū l-'Ala' was his being a highly productive author, it should be no surprise that Ibn Zuhr, just like his father, became such himself. Karamanou *et al* tells us that "at least nine of his works are known but few are extant." Those known but no longer extant works by Ibn Zuhr include:

Al-Tiryāq al-sab 'īnī ("On Antidotes")
Fī 'Illatay al-Baras wa'l -'bahaq ("On Dermatological Affections" – mainly vitiligo and leprosy)
Fi' Ilal al-kilā ("On Kidneys")
Al-Tadhkirah ("The Remembrance" — dedicated to his son)

Fi al-zīna ("On Beautification and Cosmetics")
Jāmi' Asrār al-Tibb ("Compendium of Medical Wisdom")

Three major books by Ibn Zuhr have survived the ages:

Kitāb al-iqtisād ("The Book of Moderation" — summarizes his views on various diseases, hygiene and the role of psychology in therapeutics) The book's lengthier title, which is rarely referred to, is *Al-iqtisād fi Islah Al-Anfus wa al-Ajsad*.
Kitāb al-aghdhiya ("On Dietetics" — written at the request of his patron, Abd al-Mu'min, to provide information on foods and their therapeutic advantages)
Kitāb al-Taysir ("Book of Facilitation")

Kitāb al-iqtisād, completed in 1121 CE when Ibn Zuhr would have been about 30-31 years old, was the first book he authored. Dedicated to one of the Almoravid princes, Ibrahim ibn Yūsuf ibn Tāshufīn, Tchanz provides the following description of this work:

> The book, written for laymen, gives a summary of diseases, therapeutics and hygiene. The introduction is a long treatise on the relation between psychology and health. The main text consists of seven sections that relate to diseases of: 1) the tongue and mouth; 2) the eyes; 3) ear, nose, scalp, and face; 4) neck, brain, arms, armpits and fingers; 5) buttocks; 6) scabies, furuncles and tumors; 7) acute conditions including fevers, chills, myopathies, and edemas.
>
> It appears that Ibn Zuhr's intention was to discuss the ailments of internal organs, including the brain, heart, lungs and kidney in a future book that was never written. This book is interesting, but as one commentator has said, it is a first work and its real value is in comparison to Ibn Zuhr's later works.[6]

At this early stage in his medical career, Tasci correctly states that "Ibn Zuhr was known as being a convinced Galenist," though later on he "drifted away from Galen's theoretical focus and spent a lot of time on experimental and therapeutic medical practices."[7] What we see in *al-iqtisād*, however, is early-career Ibn Zuhr, the "convinced Galenist." As a result, Azar points out that in the book's introduction we see Ibn Zuhr "frequently referring to the authority of Galen."[8] Though a Galenist, he still advocated a Preventive Medicine approach to the treatment of his patients' illnesses, for in *al-iqtisād*, states Azar, "Ibn Zuhr considers two distinct approaches: *tibb*, medicine or the treatment of disease, and *rutba*, their prevention by a wise organization of daily life." He adds that Ibn Zuhr regarded medicine "to be of two kinds: medicine of the body, and that of the mind, the latter being far more important."[9] Indeed, Preventive Medicine and Holistic Health practitioners well know, just like Ibn Zuhr did, that half the battle in overcoming a disease is to instill hope and confidence in the patient, helping him or her to understand that the body will heal itself, if given the opportunity, and to therefore believe in and adhere to the prescribed treatment and/or lifestyle regimen.

We recall that 'Ali, the Almoravid ruler, had received many complaints about the Ibn Zuhr family, and especially about Abū l-'Ala' who one day in 1131 CE spoke an "unfortunate word" to the Emir. This led to Abū l-'Ala's dismissal as vizier and Ibn Zuhr having to flee to Morocco, as the order for his arrest had been given by 'Ali. For a while Ibn Zuhr eluded capture, and it was during this time that he found himself at one point in the company of rebels. One of the rebels wanted him to make a "quick gentle poison" which the rebel would no doubt then try to use against one of his enemies. But, Ibn Zuhr chose to risk death by refusing to carry out his captor's request, with Azar explaining as follows why he made such a courageous decision:

Ibn Zuhr was a fervent disciple of Hippocrates in matters of ethics. He stressed the Hippocratic principle of *primum non nocere*:

"Hippocrates talked about striving to help the patient. If you cannot help him, at the least do not harm him."[10]

The expression "you can run, but you can't hide" seems to have applied to anyone in Almoravid territory that the rulers wished imprisoned. Tschanz tells us that Ibn Zuhr's days being on the run eventually came to an end as "he was, however, apprehended and jailed in Marrakesh for the next 16 years. While in prison he met a woman who with whom he had children, though we do not know her name and whether she was his sole wife or one of several wives. During this imprisonment he became the father of two sons (the first of which may have died in infancy) and a daughter."[11] Obviously, the prison Ibn Zuhr found himself in did not strictly segregate the male inmates from the female inmates. Also, one wonders how long Ibn Zuhr's wife's sentence was, for one would not have wanted her children's first years to have been spent in prison. In any event, the prison provided Ibn Zuhr enough freedom to try to treat another inmate's terminal cancer, as Karamanou *et al* detail below:

Avenzoar described the case of a man that he met during his stint in prison: "He could not digest his food and he was suffering from relapsing fever, stronger at times, and weaker at other times. He also was complaining of diarrhea and no one could understand the cause of his complaints." Avenzoar mentioned that he was cachectic and during palpation of the abdomen he found a tumor in the inferior part of the gastric region, painful at palpation. Soon afterwards the patient evacuated in the stools a slightly elongated apple-sized mass, followed by bloody diarrhea. Avenzoar realized that the patient was suffering from an incurable disease and tried to alleviate his symptoms. However, the patient died at the 9th day.[12]

Ibn Zuhr tried to explain that the man's cancer was produced by black bile, as adherents to the old Galenist humoral theory would maintain, and also by the man's consumption of raw camel meat. Whether the camel meat had anything to do with the man developing cancer, it appears that the cancer likely was not centered in the stomach. Instead, Karamanou *et al* relate that "Azar proposed that Avenzoar's description fits with a polypoid colorectal tumor."[13] What Ibn Zuhr for sure got right was that the prisoner's tumor-based disease was incurable. Now, we do not know when during his 16 years in prison this incident occurred; but, we do know that Ibn Zuhr's tenure in prison ended in 1147 CE. Tschanz explains why this happened, stating, "In 1147, the Almohads under 'Abd al-Mu'min conquered Seville and Ibn Zuhr returned as the new ruler's personal physician, and devoted himself to medical practice and teaching."[14]

Ibn Zuhr's release from prison and his becoming the personal physician to 'Abd al-Mu'min, the Almohad Caliph, initiated by far the most productive chapter of his life, with this chapter beginning with his authoring when he was in his mid-50s his second major book — *Kitāb al-aghdhiya* ("On Dietetics"). Tschanz provides this overview of the work:

Shortly after his release from prison al-Mu'min requested he prepare a general medical handbook for laymen and the court. Ibn Zuhr produced the *Kitāb al-aghdhiya* ("On Dietetics") which describes different types of food and drugs and their effects on health as well as the importance of hygiene. It also is the most readable of all of Ibn Zuhr's writings. He was clearly influenced by the simplicity of incarceration, and the spontaneity of Berber life with its elements of miracle-working and folk remedies. It also shows the value of composing a work based on personal experience and knowledge as opposed to merely summarizing and conveying the work of others.

In the book Ibn Zuhr makes several recommendations regarding diet. For example, he argues that food intake should be determined according to the season. "Since digestion in winter is stronger, the amount

of food should be greater; and since it is colder and more humid, the foods should be hotter and drier." A significant portion of the book is taken up with a discussion of the nutritional value of various foods and their preparation. Ibn Zuhr favors ordinary, fermented wheat bread cooked over the *tannur*, an earthen oven in the shape of a dome. He praises the value of mutton and lamb, which he considers the most humid and delicious. Beef is dismissed as an inferior meat.

The book also offers guidelines on general hygiene and best healthy practices regarding sleep, exercise, dwellings, grooming, bathing, pregnancy and childcare.[15]

Another way to summarize *Aghdhiya* is to point out that it differs both in content and style from Ibn Zuhr's first book, *al-iqtisād*; for it not only is a pragmatic work recommending natural, mainly plant-based remedies for a whole host of health problems, but it also serves as a guide to healthy living. As such, it could rightly be titled "The Regimen of Health." In fact, so far ahead of its time was *Aghdhiya* that Azar asserts that "were this book to be put in a modern form—with some revisions and the inclusion of current forms of alternative and complementary medicine—the *Aghdhiya* would constitute a useful manual for those who seek a sensible diet and wise guidelines for healthy living."[16]

There is another particularly unique aspect to *Kitāb al-aghdhiya*, though, for we find in this book a chapter on *khawāss* remedies, titled "Simple Medications with Special Properties." Khawāss is the Arabic word for something special, distinctive, peculiar or occult. The influence of Ibn Zuhr's father, Abū l-'Ala', who filled his *Kitāb mujarrabāt al-khawāss* book with all sorts of khawāss remedies, clearly manifests itself in this chapter. Here we see Ibn Zuhr, just like Abū l-'Ala', recommending many fantastical remedies which could not possibly work as described, while at the same time recommending some remedies which would or could work. Some examples of the many far-out remedies this chapter details are:

The left leg of a rabbit, if suspended over the thigh of a woman or of a man during intercourse, prevents pregnancy.

Ivory shavings, when drunk by a woman or a man [her spouse], the woman shall become pregnant.

It is claimed when a drum, made of the skin of lion, is struck, all other drums in the vicinity will be cut and torn.[17]

Examples of khawāss remedies Ibn Zuhr proposes which could be true and work include:

Incense, when drunk, helps in scorpion bites; so does garlic.

Frankincense sharpens the mind of the one who drinks it and increases his memory.

Eating bread, when very warm, slows digestion.[18]

The example about warm bread slowing digestion appears correct. Justin Lyon, in a November 22, 2022 article, "Is It Unhealthy to Eat Warm Bread?", published on the AllofKitchen.com website, addressed this issue. He stated: "When bread is baked, the starch in the flour can partially gelatinize—meaning that it becomes more resistant to digestion. This isn't necessarily a bad thing, as it can help you feel fuller far longer after eating. However, if you have trouble digesting starch, eating warm bread may make your symptoms worse."[19] In regard to garlic helping on a scorpion sting, the editors of the Livealittlelonger.com website, in a 2019 article, "10 Best Home Remedies for Scorpion Stings," had this to say about how to use garlic to alleviate the pain of a scorpion sting:

Fresh garlic — Take 3-4 pods of fresh garlic, wash, peel and crush to make paste. Apply the paste on the sting area. Allow it to sit for a couple of hours. Repeat the process if required.

Garlic is a medicinal herb that has been used as folk medicine for ages. The compound allicin has a soothing effect on the sting and helps reduce the swelling, as it is an analgesic and anti-inflammatory agent as well.[20]

So, based on the above information, it looks like Ibn Zuhr knew what he was talking about when he recommended one use garlic in treating a scorpion sting. With respect to Ibn Zuhr's recommendation to use frankincense for the purpose of sharpening one's mind and memory, Elham Asadi and three co-researchers conducted in 2019 an experiment to see how accurate this recommendation is. Over a 4-week period Asadi *et al* had 12 elderly men take twice daily a 500-milligram frankincense pill, while a control group of 8 elderly men did not consume any frankincense. A linear move machine model tool was used for motor memory measurement. The study, "Effect of 4 Weeks of Frankincense Consumption on Explicit Motor Memory," published in the August 9, 2019 issue of the *Turkish Journal of Medical Sciences*, ended up pretty much confirming Ibn Zuhr's recommendation. State Asadi and his co-researchers: "The results of this study showed that 4 weeks of frankincense consumption was effective on explicit motor memory of the elderly… Other [studies'] results showed that the combination of two herbs—frankincense and lemon balm—for one month in the elderly (without Alzheimer disease) improved general memory and two subscales: immediate and auditory memory."[21]

Living in what most of us call "modern times" and believing (incorrectly) that most of our personal actions and those of others in society are "science-based," we have trouble understanding why Ibn Zuhr, living over 900 years ago in a much more spiritually-oriented era, sometimes embraced fantastical khawāss remedies. Tasci addresses this question, explaining as follows that even many physicians living in Ibn Zuhr's day could not understand why khawāss remedies were something he would ever recommend: "Despite being an acclaimed physician of his time, Ibn Zuhr was controversial, too. His practice of khawāss remedies, an ancient style of treating sick people with a combination of herbs and physical and mental practices, was sometimes considered curious. For instance, he recommended staring into the eyes of wild asses to maintain good eyesight and prevent cataracts forming within the eyes. Many physicians of his time could not fathom the reason behind Ibn Zuhr's passion for khawāss since he was a technically-sound physician whose medical prescriptions followed the official line."[22] Perhaps the reason why other physicians could not understand Ibn Zuhr's utilization of khawāss remedies for some of his patients is because they had not spent 16 years in prison, which leads us to our next point.

We recall Tschanz mentioning that Ibn Zuhr's 16 years of imprisonment greatly influenced him, whereby "merely summarizing and conveying the work of others" lost its attraction to him. Instead, he developed an open-minded, investigative mindset which favored conducting experiments in order to cast more light on or settle a medical question. Indeed, Rabie Abdel-Halim, in his 2005 paper, "Contributions of Ibn Zuhr to the Progress of Surgery," published in the *Saudi Medical Journal*, informs us that Ibn Zuhr's most important contribution in the field of surgery was "his application, for the first time, of experimental methodology in evaluating new, or controversial surgical procedures."[23] For example, one medical question in the 12th Century CE which had remained unresolved since the 2nd Century CE was whether or not a tracheotomy could be performed safely on a person. While some physicians, such as al-Zahrāwī, maintained that the procedure could be performed without placing the patient under undue danger, many others strongly disagreed. Bothered by the fact that such an important medical question had continued to

remain unsettled for so long, Ibn Zuhr entered the fray, taking on the challenge of determining whether al-Zahrāwī had been right on this controversial procedure. Relates Abdel-Halim:

> Even though al-Zahrāwī had concluded and reported that tracheotomy is not a dangerous procedure, Ibn Zuhr noticed that tracheotomy was not being carried out in patients who badly needed it. In order to sort out that controversy and prove that tracheotomy is a safe operation, Ibn Zuhr decided to do the following decisive experiment: "Earlier on in my training when I read those opinions (controversies), I cut on the lung pipe of a goat after incising the skin and the covering sheath underneath. Then I completely cut off the substance of the pipe, an area just less than the size of a *tirmisah* (lupine seed). Then, I kept washing the wound with water and honey until it healed and it (the animal) totally recovered and lived for a long time."[24]

Abdel-Halim then indicates that all the studies involving proposed new medical drugs performed worldwide each year on animals owe much to the success of Ibn Zuhr's above remarkable experiment. He points out: "This unique experiment represents a further step in the development of the experimental school started by Rhazes of Baghdad in the ninth century who is known to have given monkeys doses of mercury to test it as a drug for human use. Nevertheless, we think Ibn Zuhr can still be given the title: **"The Father of Experimental Surgery."** Ibn Zuhr's application of an experimental animal model to a clinical problem was the forerunner of the method by which many current surgical procedures were developed. The authors who came after him in the thirteenth century such as Al-Baghdādī and Ibn Al-Quff recommended tracheotomy unreservedly in life-threatening upper airway obstruction not relieved by other means, and described the technique with more refinements and in more detail."[25]

Perhaps of even greater interest is the assertion the editors of the Science Struck website make about Ibn Zuhr in their article, "The Fascinating History of Animal Testing You Should Know About." Lacking in details, their assertion is this: "It was Ibn Zuhr who first carried out dissection and postmortem autopsy on humans other than animals."[26] Regardless of the truthfulness of this claim, we wish we knew how many dissections Ibn Zuhr performed, the background of the people whose bodies he dissected, and also how secretly he had to carry out his dissections, living as he did in a society that strongly discouraged, if not outright banned, the practice. One thing we do know is that one body he didn't dissect, much as he might have possessed grim satisfaction in doing so, was that of 'Ali, the Almoravid emir who, as noted earlier, ordered Ibn Zuhr's arrest and imprisonment, for 'Ali died in 1143 CE, four years before Ibn Zuhr's release from prison. Now, it just so happens that Ibn Zuhr was *not* the first person to have performed dissections on humans. That honor goes to two ancient Greeks who lived and worked 14 centuries before Ibn Zuhr was conducting his research and writing his medical books. Heinrich von Staden, in his paper, "The Discovery of the Body: Human Dissection and its Cultural Contexts in Ancient Greece," published in the May-June, 1992 issue of the *Yale Journal of Biology and Medicine,* enlightens us to this interesting fact, stating: "In the first half of the third century B.C., two Greeks, Herophilus of Chalcedon and his younger contemporary Erasistratus of Ceos, became the first and last ancient scientists to perform systematic dissection on human cadavers. In all probability, they also conducted vivisections of condemned criminals."[27] What is true, though, is that Ibn Zuhr was likely the first Arab physician to participate in, if not perform, a dissection on a human, a point we'll return to soon when we explore his *Kitāb al-Taysir* book.

We recall that Ibn Zuhr, upon his release from prison in 1147 CE, began serving as the Almohad ruler's court physician. It wasn't long before he received the ultimate promotion.

Karamanou *et al* relate that "Ibn Zuhr earned such a good reputation as court physician that soon he became Vizier in the court of Caliph 'Abd al-Mu'min. Moreover, he transmitted his medical knowledge to his children. His son Abu Bakr became a well-known physician, and his daughter one of the most known midwives."[28]

So far we have only mentioned in passing Ibn Zuhr's masterpiece book, *Kitāb al-Taysir* ("Book of Facilitation"), whose full title is *Kitāb al-taysir fi'l al-mudāwāt w'al-tadbir* ("The Book Facilitating the Study of Therapeutics and Diet"). Let's examine how this book came about, its contents and its significance, and see why it rightly is regarded as one of the crowning glories of the Golden Era of the Islamic Civilization.

In 1155 CE when Ibn Zuhr was about 64 or 65 years old, his talented and ambitious student, Ibn Rushd, requested that the two of them collaborate on a major book project, a request Ibn Zuhr acceded to. Ibn Rushd, age 30 at the time, later on became famous as a philosopher, and is more well known as Averroes, the latinized name the medieval Europeans gave him. Ibn Rushd also was a physician, though he mainly devoted his time to his philosophical studies. In any event, Ibn Rushd's task was to write a book on the general topics of medicine while Ibn Zuhr's task was to write a book on special topics relating to the promotion of good health and the treatment of assorted health problems. Abdel-Halim points out that the book project's goal was for "the sum of their two works to be a complete work on the Practice of Medicine."[29] The project succeeded immensely, for as Abdel-Halim notes, "the book was promptly translated into Hebrew and Latin and was printed 8 times in Latin between 1450 and 1554."[30] The portion of the combined work written by Ibn Rushd was titled *Kitāb al-Kullīyyāt* (*Colliget* being its latinized name), while Ibn Zuhr's portion was titled *Kitāb al-Taysir*, and the two books combined constituted a comprehensive medical textbook which ended up forming part of the curriculum in European medical schools for the next four hundred years.

In *Kitāb al-Taysir* Ibn Zuhr blends compendium writing, an old tradition authors of medical books had followed for centuries, with passages on theoretical and scientific medicine. Apparently, Ibn Rushd expressed dissatisfaction to Ibn Zuhr over the book's compendium aspect. And, this criticism does not seem to have gone over well with Ibn Zuhr, for the task Ibn Rushd had laid out for him had been an extremely challenging one, requiring a tremendous effort on his part to fulfill. We see evidence of this in the Prologue to *Kitāb al-Taysir* where Ibn Zuhr alludes to the criticism he received from "someone in charge," i.e., Ibn Rushd, stating:

> God be my witness. I did not stop writing this book but persevered by sheer will and determination until I finished it. Even so, I mixed what I found insufficient in a compendium (*kunnashi* method)—a method frowned upon by people with scientific views—with scientific passages and with topics of theoretical medicine. In some situations I did favor scientific writings over ancient practical terms…
>
> As to this book, I followed the path I described above. I sought, nevertheless, the middle ground as much as possible in what I compiled, in the sense that I did not become obstinate in my arguments. I took two roads. When I was approached by someone in charge of what I was doing, he was not satisfied with what I did.[31]

After the Prologue *al-Taysir* contains a lengthy introduction which begins with Ibn Zuhr presenting his favorite recipe to combat constipation, or in his words a recipe "for ensuring soft bowel habits and preserving health"—a rhubarb-tamarind-orange peel mixture. Just looking more closely at two of this mixture's ingredients—rhubarb and orange peel—we can see why this recipe

would prove effective for combatting constipation. For starters, Hong Xiang and 3 co-researchers investigated rhubarb's effect on health, and published their findings in a paper titled "What We Already Know about Rhubarb: A Comprehensive Review" in the August 26, 2020 issue of the *Chinese Medical Journal*. Xiang *et al* state their study's key finding as follows: "**Rhubarb contains a large number of anthraquinone chemical constituents, which have a strong purgatory function.** A meta-analysis of 850 constipation patients based on 10 randomized controlled trials showed that the regimen [of consuming rhubarb powder and peppermint oil] was effective in treating constipation, and no serious adverse events were reported in any trial."[32] Another study conducted by Jianqiao Yin and 6 co-researchers investigated the impact that consuming of naringenin (NAR), a substance abundant in citrus fruits, has on the body. The researchers point out in their 2018 paper, "Naringenin Induces Laxative Effects by Upregulating the Expression Levels of c-Kit and SCF," published in the *International Journal of Molecular Medicine*, that "naringenin (NAR), a natural flavonoid found in citrus fruits and tomatoes, has been reported to exhibit various pharmacological effects. Increasing evidence has indicated that NAR has potential for use in the treatment of constipation. **The results of this study suggest that NAR relieves constipation by increasing the levels of interstitial cells of Cajal markers as well as AQP3. Thus, NAR may be effective as a candidate in patients suffering from lifestyle-induced constipation."**[33] Ibn Zuhr did not, of course, have the benefit of these two scientific studies' results which demonstrated the effectiveness against constipation of rhubarb and orange peel's key ingredient, naringenin; but, obviously he didn't need some scientific study to tell him that a rhubarb-tamarind-orange peel recipe would successfully treat a patient's constipation condition, thus once again evidencing the profound wisdom and expertise that he and many of his fellow Arab and Arabized physicians of his time possessed.

Azar informs us that Ibn Zuhr's anti-constipation recipe presentation "is followed by miscellaneous simple remedies that fall into the domain of khawāss, or medications with special properties. The administration of theriac is repeatedly mentioned in this introduction and throughout the *Taysir*. Theriac, the favorite of kings because of its alleged anti-venom properties, served also as a panacea for a variety of situations and for warding off fevers."[34] Having already discussed Ibn Zuhr's use of khawāss remedies, we need now to understand what ingredients went into the theriac he gave to some of his patients. Two different preparations of the theriac are described in *al-Taysir*, both of which Ibn Zuhr said his father had taught him how to prepare. Seventy different ingredients went into the mixture, some of them being: Egyptian opium, cinnamon, licorice, saffron, ginger, rhubarb, red rose, balsam oil, wild turnip seeds, viper tablets. Azar notes that these and many other ingredients were "soaked in water and macerated together. The components of the theriac are then added one by one into pure honey, and the whole is stored in jars."[35] With theriac containing so many differing ingredients, it's no surprise that it possessed the reputation as being a cure-all. Indeed, the following are just some of the large number of distinct health benefits that Ibn Zuhr claimed in *al-Taysir* that one of his two theriac preparations provided. He states:

> It prevents the harm of pestilent air. It delivers from colic, stops diarrhea, discharges intestinal worms, aids in debilitating pains, and helps if applied over ulcers of unknown cause. It helps in epilepsy and in mania, in arthritic pains and in advanced lung ailments—particularly if the theriac is fresh. It also helps in quartan fever, in paralysis and numbness, and in many chronic ailments for which physicians know no cause.[36]

Now, could the theriac that Ibn Zuhr sometimes prescribed, in fact, actually effectively treat his patient's malady? The answer is: very possibly. An interesting study was conducted by Danuta Raj and three co-researchers of a sample of a theriac recipe dating from around 1630 CE. This study's paper, "The Real Theriac — Panacea, Poisonous Drug or Quackery?" was published in the December 5, 2021 issue of the *Journal of Ethnopharmacology*. The 1630 CE recipe was originally written and printed in Latin by Paul Guldenius, the city apothecary of Torun, Poland. Guldenius would likely have prepared this particular theriac many times during his career, as theriac was commonly prepared during the many epidemics that medieval Europe experienced. Like Ibn Zuhr's theriac, Raj *et al* found that the theriac preparation of Guldenius contained, along with several dozen mainly plant-based ingredients, opium. As a result, the researchers found that "an analgesic and anti-diarrheal effect could probably be observed" from taking this theriac; in addition, "calculations show that most likely no poisoning could result from theriac, when taken as prescribed."[37] In regard to the theriac's opium content, Raj *et al* point out that "the amount of opium in a single dose resembles the modern anti-diarrheal dosage" and that therefore "the anti-diarrheal effect may be expected with a reasonable probability."[38] Based on their thorough study of the sample of Guldenius's 1630 CE theriac, the researchers reached this conclusion: "Taking into account the [theriac's] compounds, one can expect positive effects in antioxidant tests or antimicrobial and anti-inflammatory activity,"[39] and certainly, if the above-described positive effects manifested themselves, the pain and discomfort patients experience from scores of different health afflictions would be noticeably alleviated, if not completely eliminated. In short, Ibn Zuhr's theriac preparation may have proven effective against a variety of health problems, even if due solely to the placebo effect, and at worse, acting in accordance with Hippocrates' dictum, caused no harm to the patient.

The main body of *al-Taysir* begins after Ibn Zuhr's introductory section. It is divided into two so-called "books," which is followed by a formulary, called *Jami*, of various medical preparations. The topics and diseases covered in Books I and II are arranged in the traditional from head-to-foot manner seen in so many books authored by Arab and Arabized physicians. Hence, we see Book I's contents presented in the following order:

Conditions of the scalp.
Wounds caused by iron and stone.
Diseases of the head, including meninges and brain.
Diseases of the ear.
Diseases of the nose.
Diseases of the mouth and lips.
Diseases of the eye.
Diseases of the brain and nerves.
Diseases of the neck.
Diseases of the lung.
Diseases of the heart and pericardium.
Diseases of the liver and spleen.
Conditions of the abdomen, including hernia and wounds.
Diseases of the stomach.
Diseases of the chest, including empyema and pleurisy.

In Book II Ibn Zuhr has descended quite a distance down the body from where he began in Book I, and here he deals mainly with health problems affecting lower body areas. Book II's contents are:

Conditions of the lower abdomen, including intestines and hemorrhoids.

Diseases of the kidney and bladder, including calculi.
Diseases of the testes and scrotum.
Diseases of the penis.
Diseases of the uterus and vulva.
Diseases of bones.
Conditions occurring throughout the body, which include a vast list of skin lesions (including forms of leprosy and vitiligo) and musculo-articular conditions, parasitic infestations, cancer, gout, *naghla*, and whitlow.
On fevers, crisis, and epidemics.[40]

Ibn Zuhr's early section of *al-Taysir's* Book I, "Diseases of the head, including meninges and brain," appears to present the first-ever report of a case of hydrocephalus, i.e., the build-up of fluid in the ventricles deep within the brain, resulting in developmental, physical and intellectual impairments. In a 2019 *World Neurosurgery* paper by Ahmet Aciduman and three co-researchers, "Did Ibn Zuhr (Avenzoar) Postulate Before Vesalius that Liquid Collects in Ventricles in Hydrocephalus?", Aciduman *et al* write that they first studied and translated into English both the Arabic and Latin versions of *al-Taysir*. After doing this, the paper's authors concluded "that Avenzoar might have noted one of the earliest records of the clinical state idiopathic adult hydrocephalus and postulated liquid collection in the ventricles of the brain in hydrocephalus before Vesalius."[41] And, Ibn Zuhr's report would have appeared a remarkable 400 years before Vesalius's "discovery," for Aciduman *et al* provide us the necessary context, explaining that "Andreas Vesalius (1514 – 1564 CE), in the second edition of his work, *De Humani Corporis Fabrica* (1555 CE), stated the location of the fluid collection to be the ventricles."[42] Next the paper's authors present Ibn Zuhr's statement, and we see in reading it that its discussion about the hydrocephalic's ventricles not only well matches what Vesalius had to say on the matter, but that it goes into much greater detail regarding hydrocephalus and how it affects a person afflicted with this condition:

"They mentioned that a thin and penetrating humidity appears in the anterior ventricles, and around the brain that has a fetid odor, and when this happens to someone, his intellect is confused and he can hardly raise his head and he cannot talk; if he does, he answers with difficulty and confusedly and most of his words are unintelligible."[43]

As you can probably guess, besides what was just discussed above, *Kitāb al-Taysir* contains many more "firsts," with one of the most important ones being Ibn Zuhr's description of pericarditis—the condition involving swelling and irritation of the thin, saclike tissue surrounding the heart (pericardium); this condition often causes sharp chest pain. Abdel-Halim and his co-researcher, Salah Elfaqib, in their 2007 paper published in the *Saudi Medical Journal*, "Pericardial Pathology 900 Years Ago," first point out that Ibn Zuhr's description of pericarditis appears in *al-Taysir's* Book I chapter on diseases of the heart and pericardium, specifically in a section entitled "On the fluid collection that may occur in the covering of the heart." They next present Ibn Zuhr's following description of pericarditis:

In the heart, a watery fluid collection looking like urine may occur. It is found enclosed and contained within its covering. When this happens, the patient will lose flesh until he dies in the same way as the rest of the cachectic patients die.

It may also happen that solid substances accumulate on the inside of the heart's covering, looking like layers upon layers of membranes. And hectic fever may occur because of a disturbed temperament in the substance of the heart itself or in its recently hardened fluid [exudate]. If this is at its beginning, it can be treated with moisturizing drugs using, in case the dryness is simple, medications such as the scent of

apple or drinking freshly obtained milk of young goats together with repeated use of fresh lukewarm water baths. But if the dryness is associated with fever, the smelling of "Nilover" flowers (Water Lily, Lotus) and "al-banafsaj" flowers (garden violet, sweet violet) is more beneficial than apples.[44]

So, what is so important about this description of pericarditis that Ibn Zuhr has provided? Abdel-Halim and Elfaqib answer this question in their discussion of this description, the first-ever such description, focusing on how much it is in accordance with modern-day medicine's understanding of the condition:

Ibn Zuhr not only described the serous type of pericarditis, but he also accurately portrayed the pathological findings in fibrinous pericarditis. His description of the latter may also fit with the picture of chronic fibrous pericarditis. He also described acute purulent pericarditis and involvement of the pericardium in cases of acute carditis with hectic fever. Ibn Zuhr's description of the pericardial effusion in serous pericarditis as "looking like urine" matches well with the current description of this fluid as "straw colored." This also indicates that he had seen and observed a collection of fluid that could have never been obtained except by either pericardiocentesis or post-mortem examination. **On the other hand, Ibn Zuhr's description of "solid substances accumulating on the inside of the heart's covering, looking like layers upon layers of membranes" could not have been possible without carrying out a post-mortem dissection.** This is in line with the emphasis laid out by his predecessors in the Islamic Era on the importance of thorough knowledge of anatomy for both physicians and surgeons.[45]

The significance of Ibn Zuhr's description of pericarditis is therefore two-fold. First, he provided the first-ever description of this serious heart condition, a valuable contribution in its own right to the science of medicine. Secondly, his description provides very strong evidence that he did perform or at least closely observed another person carry out a dissection on a human. The odds therefore significantly favor one being correct in saying that Ibn Zuhr was the first Arab physician and, in fact, the first known person since Herophilus and Erasistratus of the third century BCE, to have performed or to have actively participated in a human dissection.

Here's another "first" revealed in *al-Taysir,* specifically in the "Diseases of the uterus and vulva" chapter. Tasci tells us that "Ibn Zuhr was the first physician during the High Middle Ages to accurately identify cancerous formations in the stomach, esophagus, and uterus."[46] In their aforementioned paper, Karamanou *et al* provide Ibn Zuhr's description of a case of *akila*, i.e., a disease that "eats up" a woman's uterus. They add that "according to his [Ibn Zuhr's] description, we assume the diagnosis of a uterine cancer."[47] States Ibn Zuhr:

Al-Tammati, the fortuneteller, informed me that someone dear to him was stricken with this condition—*akila*, or gangrene of the uterus. I worked hard at finding out what I could do until I gave up. I informed my father about this problem and he prescribed a drug for the woman, saying that the disease was fatal. The patient's condition soon deteriorated, the pelvic pain increased, and she was bleeding profusely. All this as a result of what gangrene can do to an organ. Finally, one of the major branches of a vessel burst out and she bled to death.[48]

Abdel-Halim makes the very important point that in *al-Taysir* Ibn Zuhr, "based on his own experience, classified diseases in a practical way relevant to their management and prognosis. Furthermore, in agreement with all of his biographers, Western or Eastern, he enriched surgical and medical knowledge by describing many diseases not ever described before him, such as: pericarditis, mediastinitis, mediastinal tumors, fecal fistula, empyema, meningitis, intracranial thrombophlebitis, inflammation of the middle ear, pharyngeal and esophageal paralysis, verrucous malignancy of the colon, Peyronie's disease, purpura skin rash and scabies."[49] With respect to this

last disease—scabies—not only did Ibn Zuhr describe its effects on the body, but to the astonishment of his fellow doctors, he also revealed its true cause and its fairly simple cure. Relates Tschanz:

In a breakthrough he [Ibn Zuhr] proved that scabies was caused by the itch mite (*scabies sarcoptes*). This simple discovery completely disproved the erroneously but long-standing and much-revered theory of the four humours supported by Hippocrates, Galen and Avicenna. When he showed that curing the disease was by removal of the parasite from the patient's body and did not involve purging, bleeding or any other traditional treatments associated with the four humours, he sent a shudder through the medical world that unshackled it from blind subservience to ancient, but incorrect, ideas. As a result, he is sometimes called **"The Father of Parasitology."**[50]

Kitāb al-Taysir earns its place in the history of science and medicine as one of the greatest works ever written in another way, for it contains what likely is the first-ever proposed case-control experiment. A case-control experiment, which is an observational study used to investigate factors associated with diseases or outcomes, is one of the hallmarks of modern medicine. Scientists, especially medical scientists, conduct countless such studies annually. The outcome Ibn Zuhr proposed be studied via a case-control study was the effectiveness of the laxatives (such as his rhubarb-tamarind-orange peel mixture) he prescribed if they were administered in a different way than how he administered them to his patients. He proposed this:

It is bound to happen, whether I am still alive or dead, that some of the readers of my book will aim at misrepresenting my opinions [on laxatives and how to counteract their side effects]. Hence, they may compose a refutation for that purpose. Then I will challenge them to one [contest]: let them utilize the medicines I mentioned in the same way I prescribed and utilize it in a different way. Then, the effects and side effects of each method are to be recorded. Certainly, the experiment will either validate or invalidate my opinion, whether I was then still alive or dead.[51]

After issuing his case-control experiment proposal, Ibn Zuhr didn't stop there. Instead, he wanted to make sure that his book's reader understood how absolutely important it is to pursue truth in a rational, verifiable manner, which can be accomplished by conducting experiments. And so, as Abdel-Halim relates, "Ibn Zuhr then elaborated on how experimentation is far more accurate and reliable than syllogism in finding truth and providing evidence," and at the end of his discussion topped it off by asserting, **"Experimentation is the only way to prove truth and dismiss fallacy."**[52]

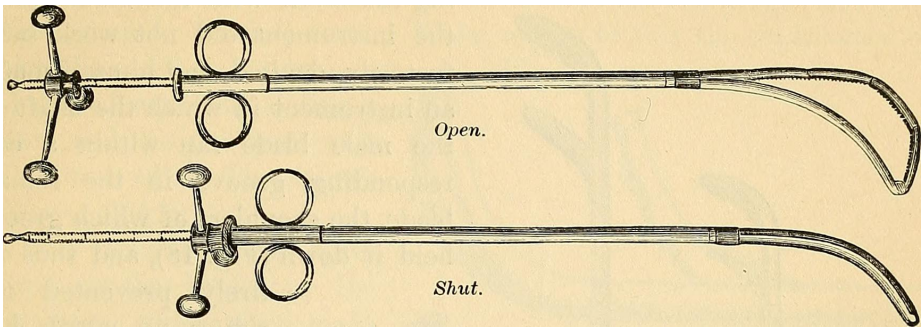
Along these lines, by this later stage of his career, Ibn Zuhr was no longer the "convinced Galenist" he had been in his early days as a physician. While he still cited Galen many times in *al-Taysir*, he did not blindly follow Galen's advice. For example, in his chapter on diseases of the stomach, he states in regard to a stomach ailment, "Even if Galen did not mention myrobalan, experience recommends it."[53] Myrobalan, a plant native to South Asia, is a sweet, astringent, warming herb that is extensively used in Ayurvedic medicine. Ibn Zuhr's experience in prescribing myrobalan to his stomach-disorder patients probably mirrored what we know today about how the herb positively affects the health of such patients. Looking at two contemporary sources of information on this subject, we see first of all the writers of the Health Benefits Times website's article, "Health Benefits of Myrobalan," state the following: "**Powdered myrobalan can reduce excessive stomach acidity and even help prevent painful peptic and gastric ulcers by elevating protective mucus production in the stomach.** Myrobalan is rich in antioxidant polyphenols like Gallic acid and ellagic acid that have been shown in studies to combat the helicobacter pylori bacteria and reduce your risk of developing stomach ulcers."[54] Next, we observe a June 7, 2015

World Journal of Gastroenterology study of Gallic acid by Mohammad Farzaei and two co-researchers. Titled "Role of Dietary Polyphenols in the Management of Peptic Ulcer," Farzaei *et al* detail their key finding of Gallic acid, which is, as was just pointed out, one of myrobalan's main components: "Gallic acid encompasses the ability to prevent and heal gastric mucosal damage induced by NSAIDs [i.e., non-steroidal anti-inflammatory drugs] by its antihistamine activity, as well as inhibiting up-regulation of pro-inflammatory cytokines and modulating inflammatory reactions… **These findings support the positive effect of dietary gallic acid in the vasodilation and angiogenesis pathways of ulcer healing.**"[55] In short, given the results of scientific studies like the one conducted by Farzaei *et al*, it is fair to say that Ibn Zuhr, in accordance with his own experience as a physician, acted wisely by recommending and prescribing the herb to those patients of his who were battling a stomach or duodenal ulcer. As for Galen, we don't know if his omitting to recommend myrobalan for those suffering from a stomach ulcer was due to an oversight on his part; but, it's neither here nor there, thanks to Ibn Zuhr correctly filling this gap.

We noted earlier that Ibn Zuhr was a fervent disciple of Hippocrates. As such, he probably knew and had sworn to the original Hippocratic Oath, patterning his practice as a physician after it. The original Hippocratic Oath that new doctors swore to was: **"I will apply dietetic and lifestyle measures to help the sick to my best ability and judgment; I will protect them from harm and injustice."** Having thoroughly studied all aspects of *al-Taysir*, Abdel-Halim was led to conclude that the book clearly evidences Ibn Zuhr's emphasis on and preference for employing dietetic and lifestyle measures to treat a patient's health problem, stating:

> It is evident from many places in *al-Taysir* that Ibn Zuhr was, by nature, primarily a physician. He abhorred cutting on the bladder stone, an operation that his predecessors—Rhazes in Baghdad and later on al-Zahrāwī in Cordoba—had made safer. He preferred medical treatment and described in detail remedies to dissolve, disintegrate or help the spontaneous passage of the stone. He even described how to detect in normal persons a tendency to stone formation: "Whenever you see in a healthy individual that his urine turns thin, looking like water, you must fear the possibility of him forming stones." Henceforth, Ibn Zuhr advised to start that individual on a prophylactic regimen of diet and herbal preparations: "Indeed, if you managed him with this regimen, I think that Allah will save him from stone formation."[56]

Now, if by chance the special diet and remedies failed to dissolve the bladder stone, Ibn Zuhr was not averse to performing what is called a lithotripsy on his patient, that is to say, a minimally-invasive surgical procedure which entailed the use of a special medical instrument invented by al-Zahrāwī. Called the *Michaab* by al-Zahrāwī, but which became commonly called a lithotrite, this instrument is a thin probe which is inserted into the urethra and threaded up into the bladder where it bores holes in the stone and breaks it up; once the stone has been broken up into smaller pieces, it is able to pass out of the bladder. Using the lithotrite avoids having to perform a urethrotomy, a much riskier and invasive operation that requires the surgeon to cut through the urethra itself in order to reach the stone. What Ibn Zuhr did to increase the chances that his performing a lithotripsy on a patient would prove successful was to actually improve upon al-Zahrāwī's invention. He describes the improvement he made to the *Michaab*: "And if a fine probe is introduced in the urethra, till it reaches the stone and the probe is of the finest caliber, with a tiny piece of diamond-stone fitted on its end; that diamond upon touching the stone will lead to its crushing."[57]



Lithotrite, originally invented by al-Zahrāwī, shown in the open and shut position. Ibn Zuhr fitted a small diamond to the tip of the lithotrite he used, improving its effectiveness.

After inventing and putting into use his diamond-tipped lithotrite, Ibn Zuhr wasn't done with creating new, helpful medical instruments. Acting in a way that would have received high praise from al-Zahrāwī, Abdel-Halim tells us that "he also designed tubes for orogastric feeding and tubes for rectal feeding in patients with esophageal paralysis, rejecting the opinion of those who claimed that such a patient can be fed by immersing him in a container full of milk or soup."[58] While we do not know what material comprised the feeding tubes Ibn Zuhr made, we are informed that supposedly the first orogastric feeding tube was in reality invented nearly five centuries later. In a 2011 paper, "Historical Highlights of the Development of Enteral Nutrition," by Stanley Dudrick, MD and Alexander Palesty, MD, published in *Surgical Clinics of North America*, the paper's authors state, "In 1598, Capivacceus, of Venice, attached a tube to an animal bladder to deliver nutrients through the mouth into the upper esophagus."[59] It is doubtful that Ibn Zuhr would have designed an orogastric feeding tube without actually trying it out; and given Ibn Zuhr's affluence, thanks to his being both the Caliphs's vizier and a physician, he would have had the financial means to design the most effective feeding tube he could think of. Therefore, although we lack details, what, in fact, is most likely is that it was Ibn Zuhr, in the second half of the 12th Century CE, who was the first to design and use an orogastric feeding tube, and not Capivacceus in the late 16th Century CE.

Seeing Ibn Zuhr's willingness to use, if necessary, his diamond-tipped lithotrite on patients who had a bladder stone, it should not be hard to understand that, although he very much preferred to treat a patient's illness or disease with mainly plant-based medicines along with dietary and lifestyle means, he completely recognized the important role surgery can play in helping to restore a person's health. Therefore, given its importance, he believed that those performing surgery needed to be professionalized—i.e., properly trained—in order to maximize the number of positive surgical outcomes. Tschanz describes what Ibn Zuhr put into place:

> Ibn Zuhr also established surgery as an independent field of medicine by introducing a training course designed specifically for future surgeons so that they were fully qualified before being allowed to perform operations independently, and for defining the roles of a general practitioner and a surgeon in the treatment of a surgical condition.[60]

During the latter part of his career, perhaps after the appearance in 1155 CE of his extremely well-received medical masterpiece book, *Kitāb al-Taysir*, people throughout Al-Andalus often referred to Ibn Zuhr as "The Wise and Illustrious." It appears that he did not author any additional books or treatises after completing *al-Taysir*, which is understandable given how much effort and time the book project had required of him. He died around age 70 in 1161 CE,

with the cause of his death being reported to be what caused the death of his father, Abū l-'Ala'—a *naghla* (basal cell carcinoma). And, just like his father, Ibn Zuhr was buried outside Seville's Victory Gate.

LEGACY

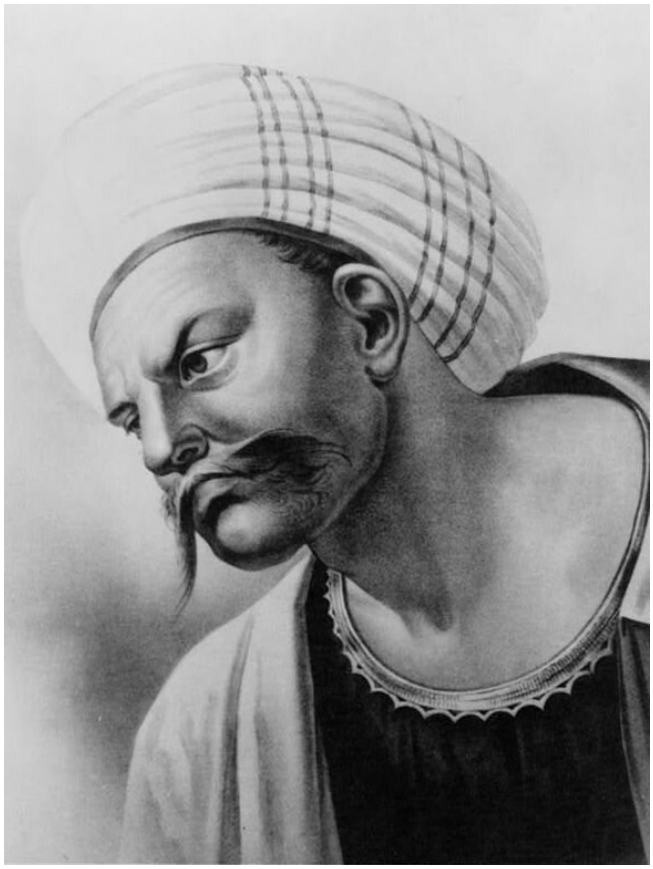
That Ibn Zuhr contributed enormously to the advancement of medicine is beyond debate. Arguably, his greatest contribution can be said to have involved his daughter, Rufayda, for Ibn Zuhr saw to it that she received training to become a physician after which she then did, in fact, enter the medical profession. Rufayda became known for her expertise in gynecology; and, deciding that the steps she herself had taken were important, she also got her own daughter to enter and serve in the medical profession as a physician specializing in women's health. Tchanz explains the significance of this development: "Though they [Ibn Zuhr's daughter and granddaughter] were largely limited to obstetrics, they began a tradition that became common in every Muslim society to the present—the acceptance of women as medical doctors. By contrast, the USA did not graduate its first female physician until 1849 and England until 1870."[61] In short, Muslim society, by accepting and allowing women to serve as physicians and surgeons, both highly professional and responsible positions, became a more forward-looking society than it had been formerly.

In determining the ranking of the doctors who practiced medicine in the western portion of the Islamic Civilization during its golden era, Abdel-Halim concluded that he is "in agreement with Ibn Khaldun, Ibn Said and Sarton, among the many distinguished physicians of the Muslim West, that Ibn Zuhr was by far the greatest," adding that he was also "perhaps the greatest clinician in Islam after Rhazes."[62] This ranking certainly seems well-deserved for one who, centuries after his death, became known as "The Father of Experimental Surgery" and "The Father of Parasitology" and who was accorded the highest compliment that a fellow physician could bestow. This compliment came from Maimonides, the great Arabized Jewish physician who lived one generation after Ibn Zuhr and who authored several influential medical books and treatises himself. Maimonides, whose life and accomplishments we'll study later, simply and frequently referred to Ibn Zuhr as **"the Master."**

Ibn Zuhr can be said to have laid the foundation for medicine to be conducted in a more scientific manner—no small accomplishment. Tschanz amplifies on this point, stating: "Ibn Zuhr's books remained popular in Europe as late as the advent of the 18th Century, and their emphasis on observation and experimentation greatly influenced the Eastern and Western medieval sciences for several centuries, laying the seeds for his intellectual heir, Paracelsus. The latter's critique of scholastic methods in medicine and the uncritical copy of the teachings of the old Fathers of Medicine, such as Avicenna, owes much to Ibn Zuhr and was a major step toward a more dynamic approach to medicine."[63]

With respect to how one should judge Ibn Zuhr as a practitioner of Preventive Medicine, Tschanz provides this accurate perspective: **"[Ibn Zuhr's] medical recipes could be compared to current forms of alternative medicine. His holistic approach and his spontaneous vignettes make him one of the most refreshing physicians of any age. Against a modern culture of often impersonal bureaucratized and costly healthcare, Ibn Zuhr's role as a caring, genuine *hakim* (healer-teacher) to his patients continues to inspire."**[64]

20. Averroes, "The Prince of Science" and his *Kitāb al-Kullīyyāt*



"Ignorance leads to fear, fear leads to hate, and hate leads to violence. This is the equation."[1] So said the last of the great medieval Muslim thinkers, Muhammad ibn Rushd, known as Averroes in the medieval Latin West as well as also today in the Western world. A man whose lifetime energy was focused on his search for and understanding of the truth, Averroes made enormous contributions to several fields of study, most particularly in philosophy and medicine. Fernando Delgado, in his 2012 *Annals of Saudi Medicine* paper, "The Neurosciences in Averroes' *Principles of Medicine*," describes Averroes as "a man of many talents, who was interested in subjects as diverse as philosophy, Islamic jurisprudence, astronomy, mathematics, geography and medicine; an original spirit, a stubborn observer of nature to the point of being an aficionado of empirical verification. In short, he was a tenacious seeker after the reality of things."[2] This "tenacious seeker after the reality of things" ended up tremendously impacting how Europeans,

especially its educated class, went about determining the truth of a piece of knowledge, for Deniz Belen, MD and Hayrunnisa Bolay, MD in their February, 2009 *Neurosurgery* paper, "Averroes in The School of Athens: A Renaissance Man and his Contribution to Western Thought and Neuroscience," point out that "Averroes had a great influence on the transformation of thought in medieval Europe beyond the borders of Moorish Spain. His thoughts and philosophy were later considered as a doctrine and called Averroism, an Aristotelian movement that can claim a history of four centuries (from approximately 1200 CE to beyond 1600 CE)."[3]

To see how Averroes eventually became so impactful, we, of course, need to learn what transpired early in his life. Born January 1, 1126 CE in Cordoba, he belonged to a highly influential family of jurists and scholars whose heritage was a mixture of Berber and *Muladi* (Christian Iberian-Visigoths converted to Islam). His father was a prominent figure in Cordoba, being the city's *qādī* (chief judge); but, his grandfather, who also had been Cordoba's *qādī*, was even more famous, having authored many important books on jurisprudence. Under the circumstances, it was natural for Averroes' father to want his son to carry on the family tradition of serving as a judge and becoming an expert on Islamic law. Accordingly, Averroes received a thorough early education in *hadith* (traditions of the Prophet), *figh* (jurisprudence), and theology. He next studied medicine under two great teachers—Ibn Juryul (a Valencian physician) and Ibn Harun at-Turjali (from Seville), who likely taught him philosophy as well. During this formative period of his life—as a teenager and young adult—is when Averroes developed an intense interest in the "sciences of the ancients", that is, Greek sciences and philosophy. He took a special interest in the works of Aristotle, the great 4th Century BCE Greek philosopher who also is regarded as the first true scientist, which years later led to his writing so many authoritative books and treatises on this philosopher's teachings that by the 13th Century CE he became widely-known as the Commentator on Aristotle. After a while, no longer relying on mentors, he himself became his greatest teacher. Abdelghani Tbakhi and Samir Amr, in their 2008 *Annals of Saudi Medicine* paper, "Ibn Rushd (Averroes): Prince of Science," inform us that "Ibn Rushd loved books. It is said that he never missed reading or writing except the day he got married and the day his father died."[4] To summarize this early stage of Averroes' life, we can say firstly that given the probable wealth of his family, due to his father and grandfather both being powerful qādīs, Averroes no doubt received the best education money could buy; secondly, this same level of affluence enjoyed by his family appears to have allowed Averroes to freely pursue his intellectual interests for many years without having to be bothered by holding down some job.

Although Averroes ended up during his life authoring 38 philosophical works, along with works on astronomy, music, poetry, and rhetoric, the first book he ever wrote was, interestingly, on medicine—his *Kitāb al-Kullīyyāt* ("The Book on Generalities"). This book, as we recall from our examination of the life of Ibn Zuhr, comprised the first half of the extremely popular and influential medical textbook he co-authored with Ibn Zuhr, the second half being Ibn Zuhr's *Kitāb al-Taysir.* It was translated into Latin in 1255 CE by Bonacosa of Padua under the title *Colliget* ("Generalities"); after the invention of the printing press in 1436 CE and this new technology's having become well-established a few decades later in Western Europe, the first print version of *al-Kullīyyāt* was made in Venice in 1482 CE. So many future reprintings of this book were made that it ended up surpassing in widespread use all other medical works of the Middle Ages. To best appreciate what Averroes was attempting to accomplish in *al-Kullīyyāt*, we need to better

understand his philosophy as well as his emphasis on the role observation must play in order for new knowledge to be regarded as valid and true.

With respect to Averroes' philosophy, we mentioned earlier that his philosophical works inspired a movement that lasted for four centuries. Called Averroism, this movement's main ideas, being contrary to the doctrines of both Islam and Christianity, upsetting devout Muslims and devout Christians alike, were as follows:

> 1) there is one truth, but there are at least two ways to reach it, through philosophy and through religion; 2) the world is eternal; 3) the Soul is divided into two parts, one individual and one divine; 4) the individual soul is not eternal; 5) all humans share one and the same divine soul at the basic level (an idea known as monopsychism); and 6) resurrection of the dead is not possible.[5]

The main gist of Averroism is that it entailed and advocated the complete separation of philosophy from religion. Rather than support what Avicenna called the "marvelous order of being," Averroes instead, as Delgado points out, strongly "attacked the concessions to religious ideology and presented the idea of an independent and scientific interpretation of philosophy, rendering unto God that which is God's and to temporal wisdom that which belonged to it."[6] This idea and many of Averroes' other ideas on philosophy's necessarily distinct and separate nature from that of religion provided great impetus to the development of modern secularism. It is for this reason, as Belen and Bolay note, that Averroes is regarded by many as the **Founding Father of Modern Secularism**.[7]

That a philosopher and physician possessing Averroes' secularistic mindset arose in 12th Century CE Al-Andalus is attributed to the impact that "intimate contact with the Christian West" had on the resident Muslims. The Western European Christians and Jews of that era seem to have been practical, fairly down-to-earth people, for Belen and Bolay state that "the medical and philosophical literature issued by the Christians and Jews of Muslim Spain is based more on the practical realities and attach less importance to dialectic vanities."[8]

Now, with respect to the importance Averroes attached to observation, he regarded this as being indispensable if one were trying to determine the cause of a particular phenomenon, such as a patient's illness. It goes without saying that knowing the cause of a patient's illness or disease, for example, could make the difference between life and death for the patient. So, in Averroes' eyes the search for the truth always started with observation. As Delgado notes, "As his first point, **Averroes established observation as the basis of his knowledge**, making his deductions from the work he had done or had observed in performing autopsies."[9] Averroes' own words make it clear that he believed proper treatment of an illness is reliant upon it being based on observation, rather than on speculation. He states: "You must understand that **medical treatment does not consist of speculating about a possible illness that might occur, being evaluated by mere hypothesis, but attempts rather to identify all illnesses through perception and observation in order to establish their causes thereafter."**[10] Delgado next expands on this matter, mentioning the remarkable fact that Averroes appears to have prefigured the great 18th Century philosopher, Immanuel Kant, by about 600 years vis-à-vis the setting forth of the general principle of causality:

> What we now call scientific validity is based on the universal value of the general principle of causality, as Averroes observed several centuries before this principle was set out by Kant. This principle is not a postulate, but rather is based on the repeated observations of experience. Whether it is a matter of creation, generation, transformation or motivation, for a piece of knowledge to be acceptable as such, it is

essential to accept the real necessity of a cause; otherwise, it is not science. The intention of Averroes was to ascertain the truth, thus confirming his confidence in the ability of the human mind to comprehend the world.[11]

We shall now examine in depth *Kitāb al-Kullīyyāt* wherein we'll see among other things that Averroes' focus on observation led to his making and reporting in this book two important medical discoveries. For starters *al-Kullīyyāt*, containing approximately 800 pages, is organized into 7 books: 1) *Tashrih al-a'da* ("The Book of Anatomy"); 2) *Al-Sihha* ("The Book of Physiology"); 3) *Al-Marad* ("The Book of Pathology"); 4) *Al-Alāmāt* ("The Book of Symptomatology"); 5) *Al-Adwiya wa'l aghdhiya* ("The Book of Pharmacology"); 6) *Hifz al-sihha* ("The Book of Hygiene"); 7) *Shifa al-amrad* ("The Book of Therapeutics").

Averroes early on provides the reader his definition of medicine as being "an effective art, based on true principles and concerned with preserving man's health and abating disease, as far as possible, in dealing with individual bodies. Thus, the aim of this art is not to heal necessarily, but rather to do what ought to be done, to the extent possible and within the time-span needed."[12] He then points out what is required in order for one to preserve good health—and really only two things, he maintained, need to be in place for this to occur. Majid Fakhry, in his biography, *Averroes: His Life, Works, and Influence*, describes these two things Averroes considered necessary for the maintenance of health: "a good digestion and a sound bowel movement. The first consists in choosing those foods which are appropriate in point of quality, quantity, time and frequency. Those include a balanced diet… Exercise is recommended following proper digestion, and bathing following exercise, but before eating."[13] And, if the physician could only accomplish one thing with his patient, Averroes would likely say that it should be restoring the patient's ability to have regular bowel movements. As Belen and Bolay state, **"Averroes considers that the physician's primary philosophy must focus on preventive measures, and elimination should receive all the effort when any disease occurs."**[14] We have seen Ibn Zuhr and other medieval era Arab physicians assigning similar disease-prevention importance to a person's having regular bowel movements; in Ibn Zuhr's case we recall him presenting in his *Kitāb al-Taysir* his favorite recipe for combatting constipation—a recipe which he described as "ensuring soft bowel movements and preserving health."

The Preventive Medicine focus of Averroes' teachings shines brightly throughout *Kitāb al-Kullīyyāt*. Fakhry informs us that Averroes stressed "the role of reasoning in medicine," arguing that **"indeed a good physician is necessarily a philosopher**," a position he shared with Aristotle who maintained, as Fakhry notes, "that philosophical learning, especially in logic and physics, is an essential prerequisite of mastering the theory and practice of medicine."[15] Averroes then goes on in *al-Kullīyyāt* to make the point that many physicians, due to their lack of possessing the proper view of therapy, are often not only ineffective, but are at times responsible for their patient's death. Relates Fakhry:

> The physicians, he [Averroes] explains, base their view of therapy on the maxim that the opposite heals its opposite and the like heals its like. The philosophers, contrariwise, base their view on the principle that healing, like any natural or artificial process, consists in the progress from one given principle to another, in accordance with a fixed procedure directed towards a desired result. Not only in therapy, but in all other medical procedures, argues Averroes, the same natural process or transition from a determinate state to another occurs, and although art imitates nature in this respect, the ways of nature are superior. Thus, in the restoration of health, recourse to natural methods of healing, such as exercise, bathing, massage

and the like, are more effective than artificial procedures, such as medication, surgery and the like. Averroes writes, in conclusion, that: **"When the physician treats a patient in any way at all, he is really assisting nature according to a determinate course of action and towards a determinate goal. That goal is either of the same type as the disease or that of health. If the physician is ignorant of that course or that goal . . . and treats the patient in a haphazard way, he will be essentially at fault and is right only by accident."** Such a physician will tend to be successful in very rare cases and will fail in most cases. **That is why Aristotle is quoted by Averroes as saying (in *Parva Naturalia*) that most patients who die actually die by reason of medicine, or rather the physician's fault.**[16]

The very serious and tragic problem of patients dying due to the fault of the physician is just as much with us today in the 21st Century as it was in Averroes' day in the 12th Century. Thomas Rodziewicz and two co-researchers, in their May 2, 2023 *StatPearls* paper, "Medical Error Reduction and Prevention," provide us many head-shaking findings, with the following two findings perhaps being the worst: 1) in the United States "approximately 400,000 hospitalized patients experience some type of preventable harm each year," and 2) in the United States "medical errors in hospitals and clinics result in approximately 100,000 people dying each year."[17] One has to think that many, if not most, of these deaths occurred because the physician whose patient died ignored Averroes' advice to embrace as his or her primary philosophy the employment of preventive measures to preserve the patient's health.

Now, Averroes maintained that another prerequisite, besides being a philosopher, needed to be met in order for one to become a good physician—a prerequisite Rhazes rated as the most important one of all. As we recall, Rhazes once stated after bringing back to life a seemingly dead man, "Experience is of more use than a physician." Fakhry points out that "Despite his insistence on the correlation of medicine and philosophy, Averroes believed that 'the acquisition of the universal principles of this art, coupled with prolonged experience… will enable the physician to acquire a series of empirical premises which are essential to the art of healing.'"[18] In other words, prolonged experience as a practicing physician would assist one in recognizing that the patient's symptoms were not the health problem's underlying cause, but rather were indicators of what the actual disease producing the symptoms was. Fakhry amplifies on this, first informing us that in *al-Kullīyyāt* Averroes defined disease as a condition "whereby it acts or is affected contrary to the natural order," and then adds that "on the other hand, Averroes defined symptoms as conditions which are usually caused by disease and therefore serve as the physician's pointers to disease."[19]

To highlight the importance of the physician being able to understand the disease vs. symptoms relationship, Averroes then lists in *al-Kullīyyāt* several diseases and their corresponding symptoms, such as:

1) Persistent migraine headaches, which could cause disorders of the eyes.
2) Excessive obesity, which may lead to heart attack and instant death.[20]

In the above first case, a doctor simply trying to treat the patient's eye problem without also trying to eliminate the patient's migraine headaches needs to understand that such a treatment plan is doomed to failure, as the cause of the patient's eye problem is not being addressed. Similarly, in the next case, a second heart attack is a high probability as long as the physician does not address the patient's serious obesity condition, the likely main cause of any first heart attack suffered by such a patient. Fortunately, years of on-the-job experience, Averroes concludes, will allow the observant physician to recognize these types of cause-and-effect relationships. As for Averroes' own on-the-job experience as a physician, it was limited, being focused primarily on

treating his friends and relatives, plus serving for a brief stint in 1182 CE as the caliph's court physician; nonetheless, it proved sufficient to assist him in obtaining the thorough knowledge of medicine and its best practices that he conveys in *al-Kullīyyāt* and his other medical works.

Because of Averroes' strong belief in the importance of observation in the practice of medicine, it should come as no surprise that he not only advocated in various sections of *al-Kullīyyāt* that physicians study anatomy, but also mentions both dissection and autopsy. Belen and Bolay note that no documents exist indicating that Averroes himself performed any human dissection. "However," they add, "he was aware of it being carried out by some of his contemporaries, such as Ibn Zuhr, and appears to have supported the procedure. Averroes states that the 'practice of dissection strengthens the faith' (*al-Kullīyyāt*, Folio 3) because of his view of the human body as 'the remarkable handiwork of God in his creation.'"[21]

We said earlier that Averroes presents two new medical discoveries in *al-Kullīyyāt*. We'll look first at Averroes' discovery of the main cause of a stroke. Prior to the appearance of *al-Kullīyyāt* the belief had been that a stroke was caused by, as Belen and Bolay state, a "blocked transmission of blood and spirit between heart and its periphery. Galen did not mention the role of the brain in stroke."[22] It seems strange to us living today that 12th Century scientists and doctors did not know that the great majority of strokes (ischemic strokes) are caused by a blood clot that travels to the brain and blocks one of its blood vessels. But, given that back then there existed no brain or body imaging equipment—such as X-ray, MRI, and CT scan machines—one sees how such a misunderstanding could have persisted. Combining his sharp observational skill with his unmatched powers of reasoning, Averroes figured out that both the brain and the heart constitute the key players in the case of a patient who suddenly experiences paralysis and other common stroke symptoms (difficulty speaking, etc.). Belen and Bolay describe Averroes' line of reasoning, which proved correct, and which was set forth in *al-Kullīyyāt* nearly five centuries before the discovery of the circulation of the blood by William Harvey in 1628 CE:

> Averroes started his attack on the Galenic system with a simple bedside observation. How could respiration, which was thought to be affected by the animal spirit, he may have asked himself, be preserved in paralyzed apoplectic patients, if the transmission of the animal spirit from the brain to the thoracic muscles was completely interrupted? Obviously, at this point, Galen's physiological teachings showed a striking gap that was only to be closed by returning to Aristotelian ideas. Logically, Averroes postulated that motion in general and respiration in particular were controlled by 2 principal organs, the heart and the brain, with the former being more important in this respect than the latter. This point of view inevitably led to a different concept of all diseases associated with impairment of movement (and also of sensation and mental functions). No longer were the brain and nerves seen as the exclusive "seats" of those disorders. Now, the heart and the arteries again came into play as possible locations of the basic pathology. In the case of apoplexy, however, the heart itself as the site of pathological changes was ruled out by Averroes, because an "event" in the cardiac ventricles would immediately be fatal. However, the arteries were regarded as one of the key locations by Averroes. **A disease affecting the whole body, such as stroke, he wrote, "would occur because of an obstruction on the paths of the spirit which passes from the heart to the brain, and these [paths] are the arteries."**[23]

What qualifies as another discovery by Averroes, which also appears in *al-Kullīyyāt*, is the first-ever description of the neurodegenerative disease known as Parkinson's disease (PD), whose symptoms mainly express themselves as tremor, slowness of movement, limb stiffness, and gait and balance problems. This disease is not all that uncommon, for the Parkinson's Foundation reports that in 2023 about 10 million people worldwide have PD. So, it is somewhat surprising that

no other physician or scientist prior to Averroes, whether we are talking about Hippocrates, Galen, Rhazes, Avicenna, Ibn Zuhr or anyone else, had ever described this disease. Belen and Bolay inform us that Averroes "suggested the existence of Parkinson's disease and described the signs and symptoms of the disease. Despite the fact that preceding medical works did not include such an illness and did not describe similar symptoms, Averroes included a short section regarding this subject for the first time in his book. In Folio 55 of *al-Kullīyyāt*, he analyzed the disease under the chapter concerned with tremor, although he did not give it a special name. To him, the disease manifests as tremor, particularly in the extremities and in organs whose movements are controlled by voluntary muscles."[24] Averroes went on to describe the tremors seen in one afflicted with PD as being a complex movement whose magnitude varies between episodes, and then concluded by pointing out that treatment of the affliction is difficult. The accuracy of his description of PD, along with his correctly stating that treatment of PD is not easy, makes a strong argument for the renaming of Parkinson's disease to Averroes' disease, in honor of the first physician to bring the world's attention to this disease in a medical book.

A third discovery Averroes made is one that he presented in another medical book he authored—his commentary on Aristotle's *On Sense and Sensible Objects*. This discovery of his relates to the fact that it is the retina, and not the lens, which constitutes the sensing organ of the eye, a discovery many consider as being Averroes' greatest. He accomplished this via a combination of observation, that is to say, examining the physical appearance of the retina, and then application of his reasoning powers, the same approach he used to determine the main cause of stroke. Belen and Bolay provide the following details about this momentous discovery:

> Averroes suggested that the principal organ of sight might be the anterior capsule of the crystalline humor, the aranea or arachneid membrane, rather than the lens itself. He defended this possibility on the grounds that the aranea is of the highest transparency and lucidity, and as Galen had indicated, these are the properties that must be possessed by the sensitive organ. Averroes stated that the retina receives the light "from the humors of the eye, just as the humors receive the light from the air."[25]

When Averroes asserted that the retina, which to repeat is the key sensory part of the eye, receives light, he was following in the footsteps of Aristotle who had strongly criticized the claim made by most scholars of his era that "in seeing, the eyes are emitting something" (such as atoms, light, etc.). Belen and Bolay point out that, just like Aristotle, "Averroes made it clear again that vision is accomplished without any emission from the eye."[26] However, if light is not emitted from the eyes, but instead enters a person's eyes, where does the light get captured and the information it contains become transformed into something the person can understand? The answer Averroes provided was the retina, an answer which compelled people to view eyesight in a completely new, but now correct, way. Belen and Bolay explain that **"in commenting on Aristotle's work, *On Sense and Sensible Objects*, Averroes introduced a really new concept of ocular function: the forms of visible objects are transmitted from the air to the transparent media of the eye and pass through these as far as they can. In other words, until they reach the retina."**[27] Belen and Bolay add, importantly, that Averroes' discovery was not lost on future generations, and relate that Vesalius, in his *De Humani Corporis Fabrica* ("On the Working of the Human Body"), published in 1543 CE, noted that many of his contemporaries believed "the tunic" (which was the name he called the retina) to be the principal organ of vision.[28]

Besides writing his commentary on Aristotle's *On Sense and Sensible Objects*, Averroes also authored many summaries of Galen's medical treatises, including *On Diseases and Symptoms*,

On Fever, *On Medications*, *On Natural Powers*, *On the Elements*, and *On Hygiene*.[29] Other surviving medical works of his are *Medicinal Herbs*, *On Treacle*, and *The Differences in Temperament*. Given the quantity of Averroes' works on medicine and philosophy, his clear mastery of both these fields as well as his expertise in many other fields of knowledge, such as jurisprudence and mathematics, it is understandable why at some point he became known as "The Prince of Science." In 1169 CE, at the age of 43, his life as a full-time scholar came to an end, as he was appointed qādī (judge) of Seville. Two years later he become qādī of Cordoba, his hometown. This job lasted eight years before Averroes in 1179 CE reassumed his first job as qādī of Seville. During these years while serving as a judge, Averroes was able to find enough free time to continue to pursue his intellectual interests, as this was when he wrote a large number of his commentaries on Aristotle's works and also one on Plato's *Politeia*. Tbakhi and Amr relate that "in 1182 CE, he was called to Marrakesh to work as personal physician for the Caliph there, but he was soon transferred back to Cordoba with the title of Great Qādī (Chief Judge)," occupying the same powerful and prestigious position both his father and grandfather had held.[30]

Now, Averroes' initial appointment in 1169 CE as qādī in Seville came about thanks to his close friend, Ibn Tufayl, the Caliph's royal physician. It turns out that Abū Ya'qūb, the caliph, was very interested in philosophy and wanted to understand better the opinions held by philosophers on certain important questions. He let this be known to Ibn Tufayl who thereupon in a nice, complimentary way introduced Averroes to the caliph. Fakhry relates what happened next after Ibn Tufayl concluded his introduction by commending Averroes for "his acumen, his sound instinct and his attachment to the art of philosophy":

> Whereupon, we are told by the historian al-Marrākushī, the caliph addressed to him the question: "What do the philosophers believe regarding heaven? Is it eternal or created in time (*hadith*)?" In response, Averroes, thoroughly taken aback, denied that he was "engaged in the study of philosophy." To allay his fears, the caliph then proceeded to expound the views of Plato, Aristotle and the other philosophers on this question, as well as the objections of Muslim scholars to these views. "I found in him [i.e., the caliph] a profuseness of learning I did not suspect in specialists in that field," Averroes later told one of his disciples.
>
> It was chiefly as a result of this encounter of the philosopher and the prince that Averroes' philosophical career was launched. For that prince, an avid reader of Aristotle, had complained to Ibn Tufayl about "the obscurity of Aristotle's idiom or that of his translators" and expressed the wish that he might attempt an interpretation of the philosopher's works for his use. Already advanced in years, Ibn Tufayl excused himself and recommended Averroes, whose talents he greatly admired, as we have seen. From that time on Averroes' career as the Commentator began, since his earliest Aristotelian works, the paraphrases of the *Parts of Animals*, the *Generation of Animals* and the *Parva Naturalia* (Kitāb *al-Hiss wa-l-mahsūs*) were written in the same year, 1169 CE.[31]

In 1184 CE Abū Ya'qūb died and was succeeded by Yūsuf Ya'qūb. Remaining in good graces with the new Caliph, Averroes continued authoring a multitude of books while also serving as the Great Qādī in Cordoba. Two important books he authored during this period included *Treaty of the Pilgrimage* (1188 CE) and the *Paraphrastic Exhibition of the Republic of Plato* (c. 1194 CE). These books, as Joaquim Gea, in his 2020 *Open Respiratory Archives* paper, "Averroes, Rationalism and Systematization in Medicine," points out, "harshly criticize the successive political systems of the Muslim Iberian Peninsula and were also a courageous plea for the role that women should play in that society," a position not likely to have won Averroes many friends in the government or also with Muslim clerics.[32] Specifically, with respect to women, he stated that "women should be treated as human beings, not as domestic animals."[33] Although we know nothing about Averroes' wife, one has to assume that she helped him come to the belief in the

essential equality of women to men in Muslim society. Now, these highly productive years in Averroes' life ended in 1195 CE when, as related by Tbakhi and Amr, he "fell out of favor with the Caliph due to the opposition that theologians had raised against his writings. He was accused of heresy, interrogated, and banned to Lucena, a town close to Cordoba. At the same time, the Caliph ordered the books of Averroes to be burnt, with the exception of his works on medicine, mathematics and astronomy."[34] Fakhry tells us that one of the heresy charges levelled against Averroes had to do with his insinuating that passage 54:19 of the Koran was untrue. This passage concerned the People of 'Ad, an old tribe in Arabia residing in a city called Iram, who supposedly had been destroyed by the wind. Averroes' remark, considered heretical by his opponents, was "Indeed, the People of 'Ad is uncertain, what then of the news of their destruction?"[35]

In a way it is remarkable that Averroes and his philosophical works had remained unscathed for so long given that his teachings, such as "the individual soul is not eternal" and "resurrection of the dead is not possible," were bound to anger and offend both orthodox Muslims and Christians. Finally, though, his intolerant critics got their way, but not permanently; for Averroes spent 2-3 years in official disgrace before the Caliph had a change of heart, revoked the ban, and recalled him back to the royal court in Marrakesh, the place where much earlier in his career he had served. It wasn't long after returning to Marrakesh that Averroes, "The Prince of Science," died on December 11, 1198 CE at age 72. Gea speculates that the cause of his death "was perhaps the aftermath of a possible rheumatic fever he suffered in his youth," an infection which frequently damages a person's heart valves and thus often leads later in life to congestive heart failure.[36]

In summarizing this man's life, we shall address two questions: What were Averroes' contributions to mankind? What type of life did he stand for?

With respect to his contributions, Averroes impacted the field of Medicine in an enormously positive way, with one of those ways being his pointing out the advantages of and benefits that result from a physician utilizing a Preventive Medicine approach in treating a patient. According to Gea, "Averroes' main conceptual contribution to Medicine was to have reintroduced rationalism into the comprehensive analysis of symptoms and signs linked to different syndromes, facilitating diagnoses in the relatively dark Middle Ages era."[37] But, that wasn't Averroes' only contribution to Medicine. Gea next relates that other extremely important contributions he made were "**his seeing medicine not only as a science dealing with diseases but also with the preservation of health**, the predominance that he gave to personal observations, and the importance of understanding the causes (aetiology) and mechanisms (pathogenesis) that lead to diseases. In addition, he systematized anatomy and physiology into body systems, in a similar way to what is understood toady."[38]

Of course, Averroes' philosophical teachings and works, which inspired the Averroism movement and jump-started the development of secularism in Europe, is regarded by many to be his most beneficial impact on mankind. The secularistic mindset no doubt helped motivate late medieval era scientists to investigate questions whose answers they knew might upset religious authorities. Along these lines, it has been said that whenever one has written a book which ends up being banned by the authorities, then one has done something either very wrong or very right. Galileo, the famous astronomer who was the first to observe the moons of Jupiter, had his book,

Dialogue Concerning the Two Chief World Systems, which defended heliocentrism (the idea that Earth orbits the sun, and not the other way around), banned in 1633 CE by Pope Urban VIII's Inquisitorial commission; even worse, Galileo was placed under house arrest, remaining in such to the end of his life. The passage of time showed, though, that Galileo proved very right, and instead it was the inquisitors who were the ones whose opinion and actions were very wrong. Similarly, Averroes' philosophical works suffered at first the same fate as Galileo's book, and his life too was curtailed by the Caliph. But, over time the merit of Averroes' ideas became clear; his works stopped being censored and instead served to inspire generation after generation of scholars. And so we see this highly principled man, who once said, "An army of philosophers would not be sufficient to change the nature of error to make it truth," just like Galileo, eventually get in the last laugh against his critics. Campbell highlights this point by sharing the following anecdote which, while perhaps apocryphal, is a most fitting way for us to conclude our summary of the life and contributions of this courageous genius:

When the Christians and Muslims relegated his books to temporal and his soul to spiritual flames, Averroes uttered the Arabic equivalent to the brilliant answer *Sit anima mea cum philosophis*—**"May my soul exist with my philosophy."**[39]

21. Maimonides, "the second Moses," and his *Regimen of Health*

We have come to the last of the great physicians Muslim Spain (Al-Andalus) produced: Moses Ben Maimon, called Maimonides in the West. Unlike nearly all the Arab or Arabized physicians whose lives we've examined, Maimonides was Jewish, but definitely was no ordinary Jew. Instead, he became the foremost Jewish philosopher of the Middle Ages, authoring many extremely important books on the Jewish faith, most especially the 14-volume *Mishnah Torah* which concerns itself with Jewish religious laws based on the written and Oral Torah (first five books of the Hebrew Bible—Old Testament). As one might guess, Maimonides' life experience differed significantly from the life experience of most Arab or Arabized physicians of his era. Let us therefore examine this unique man's life and how its unfolding resulted in providing the world not only valuable Preventive Medicine teachings, but also a new way to regard Science itself.

Born in Cordoba in 1135 CE, the patrilineal side of Maimonides' family had all been very well-educated, orthodox Jews. For example, Maimonides' great grandfather as well as his father, Maimon ben Joseph, served as Jewish judges, while his grandfather, called "Joseph the Wise," likely had been a highly-regarded rabbi. As a youth, Maimonides received instruction in the Torah from his father, who himself had received similar instruction from that era's outstanding authority on the Talmud (the body of Jewish civil and ceremonial law), Rabbi Joseph ibn Migash. In addition, Maimonides became deeply interested in philosophy and the sciences, including medicine, spending much of his time studying these fields. Evidencing his obviously very high level of intelligence, he authored in Arabic as a 16-year-old teenager his first book, *Maqala fi sina'a al-mantiq* ("Treatise on Logical Terminology"), a discussion and explanation of technical terms used in metaphysics and logic.

As we recall from our review of the life of Ibn Zuhr, the Almohad Berber dynasty assumed power in 1147 CE in Al-Andalus. This change worked wonderfully for Ibn Zuhr, as the new regime immediately released him from prison and he became the Caliph's personal physician. However, the assumption of power by the Almohads did not work wonderfully at all for the Jewish and Christian inhabitants of Al-Andalus. This is because the zealous Almohads were even more intolerant of non-Muslims than their fundamentalist Almoravid predecessors had been. They quickly eliminated *dhimmī* status—i.e., state protection of non-Muslims through payment of a tax—which had been in place in Al-Andalus for over 400 years. With *dhimmī* status no longer being awarded, Jews, such as the Maimonides family, residing in Al-Andalus were faced with this excrutiating choice: convert to Islam, go into exile, or be executed.

It appears that for quite a few years after the abolishment of *dhimmī* status the Almohad authorities did not exert maximum pressure on all its non-Muslim subjects to convert to Islam or go into exile. It, of course, would have been difficult for the Maimonides family to continue to stay in Cordoba given Maimon's high profile position as a Jewish judge there, and so the family left the city and initially spent a few years living perhaps with friends or relatives in the southern part of Al-Andalusia. They then moved to Fez, Morocco—another part of the Almohad Empire—where they lived for five years. The purpose of moving to Fez and living there was in order to study the Torah under the guidance of Rabbi Yehuda Ha-Cohen ibn Susan, a man whose knowledge of the Torah was reportedly unmatched as was also the ethical and religious behavior he displayed in his daily life. The instruction Maimon and his two sons, Maimonides and David (the younger son), received from Rabbi ibn Susan had to have been the best such instruction one

could possibly have been given, for Maimonides ended up writing in the 1166-1168 CE time period while in his early-30s his acclaimed *Kitab al-sirāj*—"Commentary on the Mishnah." The Mishnah is the written collection of the Jewish oral laws and traditions, known as the Oral Torah. Besides containing Jewish legal decisions dating back to Judaism's earliest days up to the 3rd Century, *Kitab al-sirāj* presents several introductory essays which discuss philosophical issues relevant to the Misnah. In one of these essays Maimonides summarized the teachings of Judaism in the form of Thirteen Principles of Faith. A few of these Principles include: 1) God exists; God is perfect in every way, eternal, and the cause of all that exists; 2) God is incorporeal—without a body; 3) God existed before all else, and 4) God rewards those who obey the commands of the Torah and punishes those who violate its prohibitions.[1] The impact of "The Commentary on the Mishnah" on practicing Jews was immediate and, more importantly, continues to this day, for the 13 Principles of Faith Maimonides set forth in this work became adopted as doctrine by most Orthodox Jews worldwide. Now, what may have motivated Maimonides to write such an important work was the tragic death of his mentor. In 1165 CE the Almohad authorities ordered Rabbi ibn Susan to convert to Islam or go into exile. Refusing to leave Fez's Jewish faithful or, of course, convert to Islam, the rabbi was executed, becoming one of Judaism's greatest martyrs. Maimonides would have seen this cruel tragedy unfold in front of his very eyes. So, by composing "The Commentary on the Mishnah," Maimonides may easily have believed that he was sharing and keeping alive the profound wisdom and teachings of Rabbi ibn Susan to the world—in short, keeping alive Rabbi ibn Susan's spirit.

Seeing what happened to Rabbi ibn Susan, the Maimonides family chose to become exiles and departed from Morocco. And really, given their strong Jewish faith, this was the only rational decision they could have made. David, Maimon's youngest son, who was interested in business as a career, would have been in his late-20s and likely had not accumulated much money from whatever income-generating work he had engaged in so far, and Maimonides himself had two very young children (both sons). So, if Maimon and Maimonides had allowed themselves like Rabbi ibn Susan to become martyrs, the surviving family members would have had to rely on David for income, but there was now no paying work for practicing Jews in the Almohad Empire. The family, in short, faced death or starvation by staying in Morocco, and clearly decided that their best chance for survival was to stick together as a full family unit and head into exile. As a result, seeking to attain what nearly all refugees seek—a positive future for themselves—the family embarked on an arduous journey eastward across North Africa; after spending at first some time in Palestine, they backtracked about 300 miles, finally in 1168 CE arriving at and settling permanently in Fustat, a city which at the time served as the capital of the Egyptian-based Fātimid Caliphate (today it comprises the historical center of Cairo). As one might guess, ultimately reaching and staying in Fustat did not occur without difficulty, for all the family members faced and overcame great hardships during their trek. Maimonides described some of these hardships in his famous "Epistle to Yemen" (also called his "Letter to the People of Yemen"), written in about 1172 CE when he was 37 years old:

> Verily, I am one of the humblest of scholars from Spain whose prestige was lowered in exile. Although I always study the ordinances of the Lord, I did not attain to the learning of my forbears, for evil days and hard times overtook us; we did not abide in tranquility. We labored hard to rest. How could we study the law when we were being exiled from city to city, and from country to country? I pursued the reapers in their paths and gathered ears of grain, both the rank and the full ones, as well as the withered and the thin ones.[2]

Fustat's population contained a sizable number of Jews who, being tolerated by the ruling Fātimids, could openly practice their faith. Thanks to the hospitable nature of the city, it appears that Maimon, Maimonides, and especially David were able to earn income in various ways. David had become a merchant, while Maimonides likely now served as a rabbi and had continued his studies at a synagogue which nowadays bears his name. It was around 1169 or 1170 CE when Maimonides experienced yet another dramatic, life-altering event. David proposed to the family that they all pool their money to fund his purchasing a large quantity of goods at 'Aydhāb, an important medieval era Sudanese port on the Red Sea; he would then return to Egypt with the goods and resell them at great profit. David certainly would have explained to his family how success of the venture would result in a significant increase in the family's financial well-being. Unsurprisingly, everyone signed on to the plan, though Maimonides warned his brother to only purchase goods at 'Aydhāb. Like many younger brothers, David, not liking the selection of goods he saw for sale there, decided to act contrary to his older brother's advice and wishes; he skipped buying anything at 'Aydhāb and instead boarded a trading vessel to India. The goods from India, being extremely desirable, would command very high prices in Egypt, and their sale would make the Maimonides family wealthy. So the thinking no doubt went in David's mind. As one can probably guess, David's get-rich plan did not work. On its way to India, the ship sank, with all those on board drowning. Maimonides took his brother's death hard, to put it mildly. S. D. Goiten in his book, *Letters of Medieval Jewish Traders*, presents the following account Maimonides wrote regarding the impact David's death had on him:

> The greatest misfortune that has befallen me during my entire life—worse than anything else—was the demise of the saint, may his memory be blessed, who drowned in the Indian Sea, carrying much money belonging to me, to him, and the others and left me with a little daughter and a widow. On the day I received the terrible news I fell ill and remained in bed for about a year, suffering from a sore boil, fever, and depression, and was almost given up. About eight years have passed, but I am still mourning and unable to accept consolation. And how should I console myself? He grew up on my knees, he was my brother, and he was my student.[3]

When his debilitating depression finally lifted, Maimonides, realizing that his family's difficult financial position urgently needed attention, decided to become a practicing physician as he refused to accept compensation for his rabbinical duties. Ariel Bar-Sela *et al* in their translators' Introduction to Maimonides' *The Regimen of Health* book provide the following insight regarding why Maimonides believed he was capable enough to pursue a career in medicine for himself:

> It is not clear where and with whom Maimonides studied medicine, although there is no doubt that he acquired the foundation of his art in the West. In his *Regimen of Health* he states, in support of a prescription, "this is what we have received from the Elders of the Art," and, again, in his *Treatise on Accidents* he states, "this we have seen the outstanding Elders do in the Land of Andalusia," but he does not mention these Elders by name. Some authors claim him as a student of Abū Marwān Ibn Zuhr (Avenzoar; 1091-1162 CE), who lived in Spain, while others place him as a student of Ibn Rushd (Averroes; 1126-1198 CE), himself a Cordoban and only ten years older than Maimonides. Maimonides himself, however, claims neither as his teacher. He frequently refers to the "venerable Ibn Zuhr," but he makes little mention of Ibn Rushd. In his treatise on asthma, he records an incident involving Ibn Zuhr, but he states that he heard it from his son Abu Bakr with whom he was acquainted. Thus, while there is no doubt that Maimonides was well acquainted with the works of these two masters of the school of medicine of the Western Caliphate, the exact source of his medical education is not yet established.[4]

Thanks no doubt to Maimonides' solid understanding of the teachings of the great physicians of Al-Andalus, notably Ibn Zuhr, it wasn't long before his new medical practice was

thriving. In addition, his effectiveness in treating patients came to the attention of Vizier al-Qādī al-Fādil who retained his services. Al-Qādī al-Fādil's boss, al-'Ādid, the last of the Fātimid Caliphs of Egypt, was deposed in 1171 CE by Saladin, with Saladin becoming the Sultan of Egypt. Al-Qādī al-Fādil, however, managed to keep his position as Vizier and proceeded to introduce Maimonides to the Sultan. This resulted in Saladin's not only making Maimonides his court physician, but also appointing him to be *Nagid* (religious leader) over the entire Jewish community of Egypt. This appointment made sense as earlier in his life in 1158 CE, at age 23, Maimonides had authored a book entitled *The Jewish Calendar*, which was then followed, as we recall, in 1168 CE with his very influential *Kitab al-sirāj*—"Commentary on the Mishnah" book; and so by 1171CE he possessed a reputation in Egypt as being an authority on Jewish matters. Given his daily duties as Saladin's court physician, running his medical practice overflowing with patients, and the time-consuming demands of serving the spiritual needs of Egypt's Jewish population, a typical day for Maimonides could only be called exhausting. In a letter to Rabbi Samuel ibn Tibbon Maimonides described the challenges he faced each day:

> I live in Fustat and the Sultan resides in Cairo; these two places are two Sabbath limits [about one and one-half miles] distant from each other. My duties to the Sultan are very heavy. I am obliged to visit him every day, early in the morning, and when he or any of his children or concubines are indisposed, I cannot leave Cairo but must stay during most of the day in the palace. It also frequently happens that one or two of the officers fall sick and I must attend to their healing. Hence, as a rule, every day, early in the morning, I go to Cairo and, even if nothing unusual happens there, I do not return to Fustat until the afternoon. Then I am famished but I find the antechambers filled with people, both Jews and Gentiles, nobles and common people, judges and policemen, friends and enemies—a mixed multitude who await the time of my return.
>
> I dismount from my animal, wash my hands, go forth to my patients, and entreat them to bear with me while I partake of some light refreshment, the only meal I eat in twenty-four hours. Then I go to attend to my patients and write prescriptions and directions for their ailments. Patients go in and out until nightfall, and sometimes, even as the Torah is my faith, until two hours or more into the night. I converse with them and prescribe for them even while lying down from sheer fatigue. When night falls, I am so exhausted that I can hardly speak.
>
> In consequence of this, no Israelite can converse with me or befriend me [on religious or community matters] except on the Sabbath. On that day the whole congregation, or at least the majority, comes to me after the morning service, when I instruct them as to their proceedings during the whole week. We study together a little until noon, when they depart. Some of them return and read with me after the afternoon services until evening prayer. In this manner, I spend the days. I have here related to you only a part of what you would see if you were to visit me.[5]

Despite his incredibly busy work schedule in Fustat, Maimonides managed to set aside some time to author additional books. His main focus at first continued to be on producing important books on Judaism. In 1180 CE he published what many consider to be his *magnus opus*, the 14-volume *Misnah Torah*, whose English translation print edition runs 600 pages. This work is a compilation and analysis of the immense number of Jewish laws, customs, regulations, and legal opinions from the Torah, Oral Torah, Mishnah and Talmud; in essence, it organized and synthesized Jewish thought. Maimonides followed up on *Mishnah Torah* ten years later in 1190 CE with the publication of his *The Guide for the Perplexed* (Arabic title—*Dalālat al-ha'irīn*). Bar-Sela *et al* describe this book by Maimonides as "the crown of his philosophical achievements. This was an attempt to reconcile Jewish thought and Aristotelian philosophy, a philosophical feat that was greatly acclaimed and often quoted by Christian scholastics, as well as by Jewish and Muslim scholars, and the influence of which reached into the age of Spinoza and Kant as well as

into our own age."[6] John Redden, in his March 24, 2015 *Viriditas* article, "Maimonides' Medical Writings — A Review of 10 Books in 7 Volumes," helps us understand the significance of Maimonides' religious-philosophical works and, as a result, why amongst orthodox Jews especially he is referred to as "the second Moses." States Redden: "The three books, *Commentary on the Mishnah*, *The Mishnah Torah*, and *The Guide for the Perplexed* ensure Maimonides' name in the annals of history. These great works are to Judaism as the *Summa Theologica* of Thomas Aquinas is to Catholicism."[7]

Around 1184 CE, quite a few years before completion of *The Guide for the Perplexed*, Maimonides began writing medical books and treatises. He is known to have authored 12 medical works, with all these being written during the last twenty years of his life. A couple of these books and treatises were written specifically at the request of Sultan al-Afdal, one of Saladin's sons and who succeeded Saladin as Sultan in 1193 CE. The following are some of the medical works authored by Maimonides:

The Regimen of Health
On the Causes of Symptoms (Latin title—*De causis accidentium*)
The Compendium of Galen's Works
The Medical Aphorisms of Moses Maimonides (original title—*Aphorisms of Moses*)
Treatise on Hemorrhoids
Treatise on Poisons and Their Antidotes
Human Temperaments
Treatise on Asthma
Glossary of Materia Medica
Book on Sexual Intercourse

Of the above works that we'll take a closer look at, the first one will be Maimonides' *Treatise on Hemorrhoids*, as it provides a natural, plant-based solution to an adverse health condition that most people have experienced at some point—constipation. Redden informs us that this work was "written as a response to a request and so is for a layman and is not for a physician. Maimonides believed that in most cases of hemorrhoids, surgery is ineffective as a cure as it does not address the cause of the problem; hence the hemorrhoids may recur."[8] Redden next relates that the treatise contains the following seven chapters:

First Chapter: Essay on good/normal digestion; Second Chapter: Discusses regarding foods one with hemorrhoids should avoid; Third Chapter: Concerning foods one with hemorrhoids should eat; Fourth Chapter: Concerning simple and compounded medications one should take regularly; Fifth Chapter: Concerning remedies applied (locally) that one should regularly use; Sixth Chapter: Concerning those regimens upon which one can rely when dealing with hemorrhoids; Seventh Chapter: Concerning the regimen to utilize in this illness from the standpoint of fumigations.[9]

In Chapter 4 of his treatise Maimonides shares with us his preferred plant-based medicinal treatment for constipation, stating: "Whenever one is constipated, the best softener is *cassia fistula* because, together with the diarrhea it evokes, the blood becomes cleansed. One should take one and a half drams [about 2 ½ grams] thereof and wash it after pulverizing it; then throw it into one-half liter of grape juice which was cooked until its volume becomes reduced by one third, and drink this concoction."[10] *Cassia fistula*, incidentally, comes from the golden shower tree, which is native to India and adjacent parts of Southeast Asia. 2 ½ grams of its fruit pulp is what is to be added into the above anti-constipation mixture.

Based on what present-day science has learned about the constituents of *cassia fistula* and grape juice, Maimonides' "concoction," as he called it, likely proved very effective in eliminating constipation in his patients. To see why this is the case, we shall first look at the findings of a paper by Ruth Mwangi and three co-researchers, "The Medicinal Properties of *Cassia fistula L*: A Review," published in the December, 2021 issue of *Biomedicine and Pharmacotherapy*." In this paper's section 4.11, titled "Purgation Potential," Mwangi *et al* state:

> The leaves and pods of C. fistula have anthraquinone glycones in addition to anthraquinone glycoside that act as a purgative and are applied in diverse traditional medicine, including TCM [traditional Chinese medicine], Ayurveda among others since time immemorial. The purgative effect of the anthraquinone found in *Cassia fistula* occurs via two independent methods. Firstly, one mechanism involves the changing of colonic motility, resulting in a faster large intestinal transportation. Motility changes arise indirectly because of high demand in the epithelial cells. The other mechanism involves modification of the colonic absorption along with secretion that led to accumulation of fluid.[11]

Now, taking a look at grape juice to see if drinking it might combat constipation, we note what Jamie Eske reports in her article, "Which Drinks and Juices are Best for Constipation?" which appeared in the January 30, 2023 issue of *Medical News Today*. Eske points out the following:

> Diets high in dietary fiber promote healthy, regular bowel function. Fruits and vegetables contain two types of dietary fiber, both of which encourage regular bowel movements and reduce constipation. Soluble fiber absorbs water and gives stools a softer, more flexible consistency, which makes them easier to pass. Insoluble fiber does not absorb water. This type of fiber helps move waste materials through the bowels. Certain fruits contain sorbitol, a sugar alcohol that pulls water into the large intestine. Extra water in the gut helps loosen hard stools so that they can move through the digestive tract more easily. Fruits that contain sorbitol include grapes…[12]

We see that Maimonides' recipe to combat constipation differed from that recommended by Ibn Zuhr who, we recall, advocated a rhubarb-tamarind-orange peel mixture and also expressed a willingness for a case-control study be performed on it in order to see if administering his mixture a different way than he recommended would prove more effective. Had Ibn Zuhr still been alive when Maimonides was practicing medicine, he no doubt would have gladly agreed to a cross-over study being performed on his and Maimonides' laxative mixtures in order to see whether one or the other was more effective on patients experiencing constipation.

Maimonides' writing his *Treatise on Poisons and Their Antidotes* is understandable given that the banks and delta of the Nile River are home to some of the world's most venomous snakes. It would not have been uncommon in the 12th Century CE for farmers working in fields near the Nile to be bitten by a snake and sometimes die from the bite. For example, the Virginia Aquarium points out that the Egyptian cobra—the snake whose bite reportedly killed Cleopatra—possesses "toxins capable of fatal bites."[13] Given the proximity of Fustat and almost all of the other populated areas of Egypt to the Nile, Maimonides likely treated plenty of patients during his medical career who had been bitten by a snake. Keeping in mind that in 12th Century Egypt one could not call 911 or the local emergency phone number upon being bitten by a poisonous snake, here is what Maimonides recommends in his treatise regarding how a snake bite should be treated:

> When someone is bitten, one must strive to immediately tie and bind a ligature above the site of the bite as tightly as possible so that the poison not disseminate throughout the body. While the site of the bite is being tied, another person should make incisions with a knife at the site of the bite and suck with his mouth as strongly as he is able. He should spit out all that he sucks. He should first rinse his mouth with

olive oil or wine and oil and then suck, and then wipe his lips with violet oil, if available, or with olive oil. The person who is sucking must be careful that he not have any illness nor any decayed teeth. Some physicians require that the sucking person be fasting whereas others maintain that he should not be fasting.[14]

Another thought-provoking book authored by Maimonides is his *Human Temperaments*. Redden states that what makes this work unique is that "in this book Maimonides places medical and daily hygienic practices squarely in an ethical and religious context."[15] He does this by presenting and explaining what he calls The Laws of Human Temperaments, which are comprised of 11 commandments. Some of these commandments include:

Cleave to those who know Him [i.e., God]
Love neighbors
Do not put others to shame
Do not oppress the unfortunate
Do not avenge
Imitate God's ways
Do not hate brothers

We can see that one dietary recommendation Maimonides made in *Human Temperaments* is related to a common human failing—lust. He advises that one "should not consume all that the palate lusts for, like a dog or an ass, but should [instead] eat things that are beneficial to the body, whether they are bitter or sweet; and he should not eat things which are harmful to the body even though they may be sweet to the palate."[16]

Another recommendation in *Human Temperaments* addresses how one should conduct oneself, essentially advising one to not be a manipulator or a liar, but instead to express oneself in an honest manner when with others. Maimonides is no doubt signaling here that acting in this way will benefit one's psyche, which constitutes an extremely important part of one's overall health. He states: "It is forbidden for a man to conduct himself to use words of flattery and seduction. And there should not be one word spoken and another in the heart; rather, the internal should be as the external, and the matter in one's heart should be that which one enunciates with the mouth."[17] What does science have to say about such advice? Emme Levine and Taya Cohen in their 2018 *Journal of Experimental Psychology* paper, "You Can Handle the Truth: Mispredicting the Consequences of Honest Communication," investigated this question. They conducted three separate studies, with 154 individuals serving as subjects in their so-called Study #1 which involved three different experimental conditions, these being an honesty condition as well as a kindness and control condition; ten experimental sessions were conducted for each condition. The directions to the Study #1 participants in the honesty condition were as follows:

> Throughout the next three days, please try to be absolutely honest in every conversation you have with every person you talk to. Really try to be completely candid and open when you are sharing your thoughts, feelings, and opinions with others. You should be honest in every communication you have, in every interaction, with every person in your life. Even though this may be difficult, you should do your absolute best to be honest.[18]

Compared to individuals in Study #1's two other experiments conditions—the kindness and control conditions—the individuals in the honesty condition "felt similar or higher levels of social connection, greater long-term hedonic well-being and greater relational improvements, and increased meaning in their life one week after engaging in their brief, but intense, honest conversation."[19] In analyzing their studies' results, Levine and Cohen reached this key conclusion: **"Scholars have long claimed that morality promotes well-being, but to our knowledge, this**

is the first research to document how enacting specific moral principles promote different types of well-being."[20] So, as we see, Maimonides' advice for one to be honest and speak the truth to others does, in fact, lead to the enhancement of a person's well-being—a fact he was well aware of over nine centuries before Levine and Cohen conducted their study.

Turning our attention next to *On the Causes of Symptoms*, this book would have been written during the 1193-1196 CE time period, as those were the years that al-Afdal ruled as Sultan in Egypt. Maimonides therefore would have been 60 years old, give or take a couple of years, when he authored this work. Like all of his medical works, Maimonides wrote the original manuscript in Arabic, and this same manuscript ultimately ended up being translated into both Hebrew and Latin (the earliest Hebrew version still extant appeared in the late 13th Century). It wasn't until 1974 that the English translation of the book, based on its Arabic, Hebrew and Latin versions, appeared in print. The work consists of 22 chapters and was written at the request of Sultan al-Afdal. One will see in the English version of the book Maimonides often mention the Sultan's "accidents" which from a medical standpoint really mean health symptoms. One will also see in Maimonides' initial address to the Sultan his calling his book "The Treatise of Decision," a title which scholars and historians have not used in referring to the work. Instead, the title preferred by scholars and historians— *On the Causes of Symptoms*—originates from book's Latin title—*De causis accidentium*. Maimonides explains in the book's introduction the reason for his writing it, stating in part:

Another work
The Treatise of Decision,
Offered in a spirit of friendship,
By Rabbi Moses, may the memory
Of the righteous be blessed

In the name of God, the Mighty and the compassionate;
God, show Thy good will and grant reward

A letter has reached this minor Servant containing a list of all those accidents [i.e., health symptoms] that have befallen our Master, may God perpetuate his days, along with an explanation of the causes of all those accidents and the times of their occurrence, information on all the particulars that a physician needs to inquire about, a description of his thoughts at each time about each accident, and an outline of what the physicians advised and wherein they agreed or disagreed. …Whereas this Servant is acquainted with those accidents that are now present, the removal of which is desired, and whereas our Master, having cited to his minor Servant what each physician has counseled, has commended him to comment on the statement of each one of them, he obeys accordingly.[21]

In Chapter 4 it appears that constipation was one of the health complaints that Sultan al-Afdal was dealing with. Maimonides states: "As to him [i.e., another doctor that the Sultan has consulted] who suggested drinking an infusion of rhubarb in water of endive one day and the abstaining for two, if he intended by that to soften the stools, then he is correct; this Servant has already mentioned the method of softening the stools with rhubarb, in the third chapter of his

treatise that has already been presented in the court of our Master."[22] Maimonides is referring here to the third chapter of his book, *The Regimen of Health,* which discusses and expands upon Ibn Zuhr's recommended constipation remedy. He states in the *Regimen*, "Ibn Zuhr, may God bless him, has said that the best thing for softening the stools is an infusion of rhubarb and tamarind…When it becomes necessary to soften with medication, take a dram [i.e., about 1.8 grams] of rhubarb and chop it, and an ounce of tamarind, cleaned of its peel and seeds, chopped as thin as possible; steep these in a pound and a half of hot water, boiling intensely, for a night. On the morrow, filter this over three ounces of refined syrup of roses. He should take it in the morning, and he should not eat thereafter until six hours have passed."[23] Since Sultan al-Afdal already had this information about a rhubarb-tamarind mixture being a remedy for constipation, it seems that at this stage in Maimonides' medical career he was no longer daily spending time as court physician in the Sultan's palace, which was something he had done when Saladin was the Sultan. If Maimonides was seeing al-Afdal in person often, he would have reminded the Sultan about what he had said in his *Regimen of Health* book about the rhubarb-tamarind mixture for constipation. Instead, he ended up having to do this by writing and sending to the Sultan a follow-up book, *On the Causes of Symptoms*. It appears therefore that al-Afdal had forgotten about Maimonides' earlier advice to prepare and take a rhubarb-tamarind mixture for constipation, and also that whoever the Sultan had consulted with about his constipation problem at least knew that rhubarb was helpful in alleviating constipation, but didn't know about the other ingredient that both Ibn Zuhr and Maimonides recommended be included in a treatment for constipation—tamarind.

As one can guess, throughout *On the Causes of Symptoms*, Maimonides presents a select list of foods that the Sultan should eat. In Chapter 20 he informs al-Afdal, who clearly possessed no ethical objections to eating the flesh of an animal, what type of meat is best to consume. "If the spirit craves the meat of cattle," Maimonides tells the Sultan, "it should be that of a suckling kid. If there is no avoiding at times the meat of sheep, those lambs that have not attained a year, but approach it, should be chosen. The forepart of the meat, especially, should be taken; it should not be excessively fat, but from grazing animals. Nothing of these should be taken unless hens or roosters become wearisome."[24] A suckling kid is a young goat which often is slaughtered at 3 to 5 months of age, meaning that its meat would be lean (low in saturated fat content compared to most other meat). J. D. Leibowitz and S. Marcus, the two editors of the English translation of *On the Causes of Symptoms*, further observe:

> The forepart of meat: This part is known to possess a lesser fat content. Maimonides was opposed to the inclusion of much animal fat in the diet; this was one of his most cherished medical precepts. It would accord with modern views on the subject.[25]

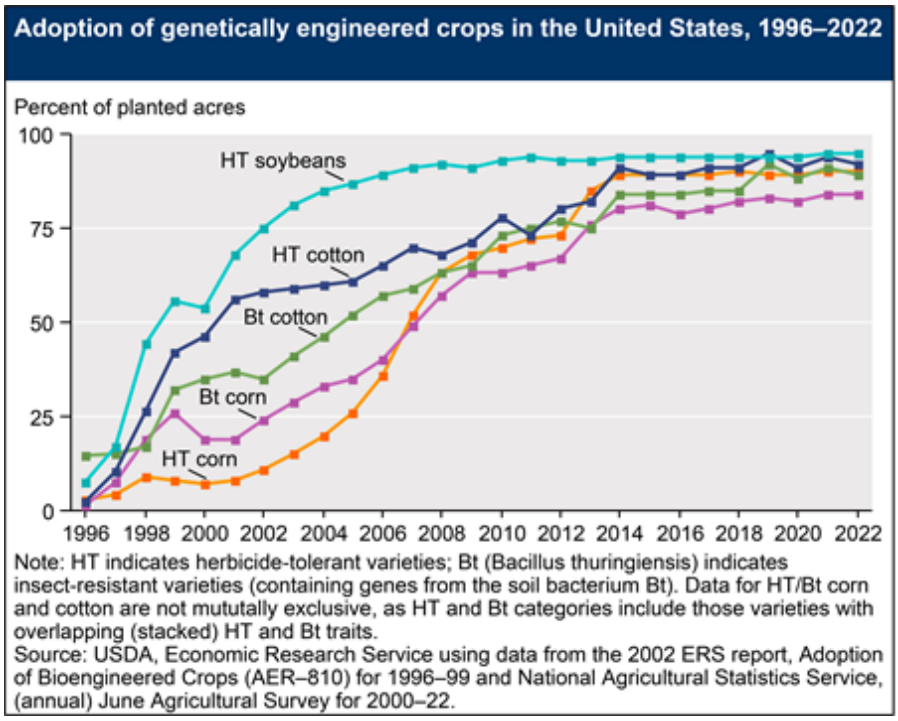
Maimonides also suggested fat-free methods of cooking—methods generally employing herbs and spices. For example, he advocated cooking with chervil, an herb known to promote digestion. For meat boiled in water Maimonides advised adding fennel, an herb which John Lust in *The Herb Book* says "helps to arouse appetite."[26] Some of the other ingredients contained in Maimonides' fat-free methods of cooking include lemon juice, currants, cinnamon bark, mastic, and purslane seeds.

Maimonides, as we saw, recommended that the Sultan not eat meat other than poultry, if possible; but this advice held true only if the poultry met certain conditions conducive to optimum nutrition. "Neither the old," he advised, "which has attained two years should be taken, not the young in which mucus is predominant, not the weak, not those force-fed, but rather the fattest

among those that are not stall-fed."[27] If Sultan al-Afdal lived today in the United States, he would have difficulty complying with this last recommendation of Maimonides', that is, to not eat the meat of stall-fed (which today would be cage-fed) chickens. This is because we learn from Tamika Sims, in her September 20, 2022 *foodinsight.org* article, "Free-Range Chickens and Cage-Free Eggs: The S(coop) on Poultry Labels," that almost all the chicken meat sold in the US comes from cage-fed chickens. Sims reports:

> **Free-range chickens constitute less than one percent of the billions of chickens produced in the United States each year.** "Free range" is defined by the USDA [US Department of Agriculture] as conditions that "ensure there is continuous free access to the out-of-doors for over 51% of the animals' lives, i.e., through their normal growing cycles." Some research has found that free-range chicken can have a somewhat lower fat content in its thigh and breast meat than conventionally raised chicken—as well as more collagen, zinc, and protein.[28]

What also must be pointed out is what cage-fed chickens in the US eat and then see how their diet compares to the diet that Maimonides recommends for chickens. For starters we are informed by the US National Chicken Council on their website that "corn is the most crucial input on raising chickens and is the largest cost component in broiler production. In fact, **two-thirds of chicken feed is comprised of corn.**"[29] But, what type of corn are the cage-fed chickens raised on US farms eating? A 2022 U.S. Department of Agriculture publication titled "Recent Trends in GE Adoption," provides a graph labelled "Adoption of genetically engineered crops in the United States, 1996-2022" which answers this question. We see on the below graph that in 2022 over 90% of the US corn crop was genetically engineered to be herbicide resistant (orange line), with around 85% of the crop being insect resistant as well (purple line).[30]


Adoption of genetically engineered crops in the United States, 1996–2022
Percent of planted acres
100
75
50
25
0
HT soybeans
HT cotton
Bt cotton
Bt corn
HT corn
1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022
Note: HT indicates herbicide-tolerant varieties; Bt (Bacillus thuringiensis) indicates insect-resistant varieties (containing genes from the soil bacterium Bt). Data for HT/Bt corn and cotton are not mutually exclusive, as HT and Bt categories include those varieties with overlapping (stacked) HT and Bt traits.
Source: USDA, Economic Research Service using data from the 2002 ERS report, Adoption of Bioengineered Crops (AER–810) for 1996–99 and National Agricultural Statistics Service, (annual) June Agricultural Survey for 2000–22.

Obviously, cage-fed chickens in the US, thanks to their eating genetically modified (GMO) corn, cannot themselves nor their meat be truthfully called "organic" or "non-GMO." Well, is this the type of feed that Maimonides recommended be given to chickens? No, of course, for two

reasons: 1) GMO grains did not exist in the 12th Century CE; 2) more importantly, being a holistic health practitioner, Maimonides would never have recommended his patients consume GMO food nor would he have supported the production of GMO foods. Here are his instructions on how poultry should properly be raised, with the difference between the US factory farm cage-fed diet and manner of living for poultry and the Maimonides diet and manner of living for poultry being like the difference between night and day:

> The manner of their management is as follows: The hens and roosters should be let loose in spacious grounds, wherein there is no dunghill or dirt, tended with cleanliness and constant sweeping. The food that they eat should be placed before them at the beginning of the day in vessels; it should be barley flour kneaded in fresh milk. It is even better if dried figs are chopped and mixed with it. Food should only be given to them in an amount that fills their crops. Water should be given to them. After several hours, **wheat should be scattered before them after soaking it for hours in water.** At the end of the day, barley flour and chopped figs kneaded with milk should again be put before them.[31]

This diet, although tailored for hens, possesses similarities to the one followed by the people of Hunza (in northern Pakistan), many of whom reputedly live to be centenarians. Jay Hoffman, in his book *Hunza: Ten Secrets of the Healthiest and Oldest Living People*, relates that one of the favorite dishes of the Hunzas is **Wheat Pudding**, whose recipe is as follows:

4 ½ cups wheat
½ cup diram (wheat flour)

Soak wheat to cover for three days. Drain and spread on cloth in sun until wheat begins to sprout. Sprinkle lightly with water daily until sprouts grow to 1 inch in length. Dry in sun and grind into flour and diram; make into chapati (round, thin pancake). Spread chapati with apricot nut oil and serve.[32]

We see that the wheat pudding dish recipe's instruction to soak wheat for three days is similar to Maimonides' recommendation that hens be fed wheat which has been soaked for hours in water. These two recommendations merit being followed, for it turns out that the nutritional value of any seed or grain soars when exposed to water. As Viktoras Kulvinskas, world famous authority on sprouts, points out, "The dry seed is characterized by a remarkably low metabolic rate, but even moistening of the seed triggers tremendous changes."[33] In other words, exposure to water activates the life force of a seed or grain. Now, how Maimonides knew that grains or seeds soaked in water would prove to be an excellent food we can only conjecture. It appears, though, that the Arabized physicians had studied this matter and had shared their findings, for Maimonides states, in regard to his diet for hens, "These things have already been tested, and their value is manifest."[34]

Several elements comprise the total health program Maimonides advised his patients to follow. One is exercise, something he attached great importance to. His patron, Sultan al-Afdal, appears for whatever reason to had not partaken in any sort of exercise for quite a while, and Maimonides believed that exercise needed to be reintroduced into the Sultan's daily health regimen. "If," he informed the Sultan, "he resumes it gradually, little by little, he will find following it the strength and the vitality that should be found after all exercise that is carried out properly."[35]

When Maimonides treated a patient, he prioritized addressing the needs of the person's mind and spirit. He realized that an individual is more than just the sum of his body's parts.

"Concern and care shall always be given to the movements of the psyche," he instructs, adding, "these should be kept in balance in the state of health as well as in disease, and no other regimen should be given precedence in any wise."[36] This is not mere pleasant-sounding advice with no follow-up on Maimonides' part, for he never failed to get down to brass tacks, making specific recommendations. For example, in Chapter 21 he tells the Sultan that after first exercising and next eating one of the healthy meals Maimonides had recommended, he then "should recline for sleep, and the chanter should intone with the strings and raise his voice and continue his melodies for an hour. Then, the chanter should lower his voice gradually, loosen his strings and soften his melody until he [the Sultan] sleeps deeply, whereupon he should stop."[37] Maimonides next explains that the deep sleep brought about by one hearing such after-meal music provides the following benefits, stating:

> Physicians and philosophers have already mentioned that sleep in this manner, when the melody of the strings induces sleep, endows the psyche with good nature and dilates it greatly, thereby improving its management of the body. Upon awakening, he may be engaged for the rest of the day in reading whatever he wishes or be attended by someone whose company he chooses. The best is the attendance of someone whose company is desirable because of his virtues, or the delight in beholding him, or his lightheartedness. All these dilate the psyche and remove evil thoughts from it.[38]

Maimonides' above statement that listening to pleasant music generally "endows the psyche with good nature and dilates it greatly, thereby improving its management of the body" has been verified by scientific studies. For example, the University of Pittsburgh Medical Center, in its website's February 16, 2017 article, "Feeling Down? Surprising Ways Music Can Pick You Up," presents the following interesting information to us:

> Scientific studies have confirmed the connection between music and mood. Some studies have found that listening to music you enjoy may increase the release of pleasure-causing substances in the brain like norepinephrine and melatonin. It may also decrease stress-causing hormone production in the body. As a result, music therapy has the power to do the following:
>
> Reduce stress/ease anxiety; Improve sleep; Lessen depressed mood
>
> Create positive mood; Boost self-confidence; Increase energy
>
> More and more studies are scientifically confirming what many of us have already guessed—music puts us in a better mood. What some people may not realize is that our mood is directly linked to our overall health. Being in a better mood improves our physical health, leads us to make better lifestyle decisions, and helps us strengthen relationships. When we feel better mentally, we feel better physically and emotionally, too.[39]

In short, what Maimonides knew in the 12th Century regarding music's impact on one's mental and physical health was no different than what scientists over 800 years later came to learn.

The Compendium of Galen's Works is said to be the first medical book Maimonides ever wrote. Redden explains that the book, although not an original work by Maimonides, still required quite an effort to compose. He states, "Maimonides took on the formidable task of reducing the available Arabic texts of Galen (20 volumes) into a single, usable volume. He divided the information into 14 chapters, not in the usual manner but by classification of diseases and their cures."[40] Unfortunately, a translation of this book into English has not been made because only less than half of the original text still exists. As Fred Rosner and Suessman Muntner, translators into English of *The Medical Aphorisms of Moses Maimonides*, point out, "*The Compendium of Galen's Works* is composed of seven books of which only three are still in existence."[41] However, another book Maimonides authored and whose subject matter seems to be quite similar to *The*

Compendium of Galen's Works has been completely translated into English, this being the above-mentioned *The Medical Aphorisms of Moses Maimonides*, or as it was originally titled, *Aphorisms of Moses*. Rosner and Muntner state that the "*Aphorisms of Moses* was written by Moses Maimonides between 1187 CE and 1190 CE and later revised," adding that the book "reminds one of the systematization of the inordinately voluminous Talmudic literature which Maimonides arranged as *halakhoth* (final legal decisions) in his monumental *Mishnah Torah*. Most of the *Aphorisms* are culled from the many works of Galen which were not well organized or arranged."[42]

The *Aphorisms of Moses*, extremely well-researched, found a very receptive audience in medieval Europe, especially with its medical school instructors and students. Rosner and Muntner explain the reason for the book's success:

Maimonides was severely criticized for not having quoted his sources in his earlier works, particularly his *Mishnah Torah* or Codification of Jewish law. For this reason, in the *Aphorisms of Moses*, he cites the source at the conclusion of every paragraph or aphorism. What he collected is masterfully compiled in twenty-five organized chapters in logical sequence and represents passages from those scattered throughout the innumerable works of Galen. It was thus the most widely known and desired repetitorium of Galen from the 13th to 15th centuries. It appeared in Latin in at least 2 versions and in 1488 CE became an Incunabulum in Bologna from which ten Latin printings were rapidly produced, attesting to its popularity. Johannes de Tournamira (1329-1396 CE), a renowned teacher at the University of Montpellier, recommended it as a textbook calling it the "Flores Galeni," (Flowers of Galen).[43]

The overwhelming majority of the time Maimonides presents with no comment on his part a statement by Galen along with the name of the book or treatise of Galen's in which it appeared. Sometimes, though, Maimonides offers a comment to what Galen had said, and whenever he does, he begins his comment with the phrase "Moses says." Now, one statement Galen made elicited a comment by Maimonides that many today would have trouble believing; it's a comment which among other things casts some doubt on the veracity of Rosner's and Muntner's statement that the "*Aphorisms of Moses* was written by Moses Maimonides between 1187 CE and 1190 CE." For we see in the Aphorisms' Eighth Treatise (chapter 8) the following statement (numbered "68") by Galen, followed by Maimonides' comment (number "69):

68. The illness diabetes is very rarely seen to occur, and only exceptionally, because until this day I [Galen] have only seen it twice.

De Locis Affectis VI

69. *Moses says*: I too have not seen it in the West [i.e., Spain and Morocco] nor did any one of my teachers under whom I studied mention that they had seen it. However, here in Egypt, in the course of approximately ten years, I have seen more than twenty people who suffered from this illness. This brings one to the conclusion that this illness occurs mostly in warm countries. Perhaps the waters of the Nile, because of their sweetness, may play a role in this.[44]

Maimonides, we recall, arrived at and settled in Fustat, Egypt in 1171 CE. So, when he remarks that "here in Egypt, in the course of approximately ten years, I have seen more than twenty people who have suffered from this illness," that would indicate that he wrote his *Aphorisms of Moses* book in the 1181 CE time period, instead of much later in 1187-1190 CE, as Rosner and Muntner assert. However, what truly is much more important to focus our attention on is not the date in which the *Aphorisms of Moses* was written, but rather the concern Maimonides expressed over observing in Egypt twenty cases of diabetes over a 10-year period, having observed no such cases when previously residing in Spain and Morocco. Can you imagine how Maimonides would feel today? This is because the International Diabetes Federation (IDF) reported in 2021 that in

the **"Middle East and North Africa 1 in 6 adults (73 million) are living with diabetes**," 796,000 of whom died from the disease that year.[45] IDF also reported similar alarming statistics for other regions of the world, with, for example, 1 in 7 adults in North America and the Caribbean living with diabetes in 2021.[46] Obviously, the days of running into no one in Spain or Morocco with diabetes and only 20 people in Egypt with the disease are long over. Maimonides, were he here now, would tell us exactly what is primarily responsible for causing today's massive incidence of diabetes: horrendous diet!

Occasionally, Maimonides presents in his book aphorisms made by other physicians. He shared this one originating from Ibn Zuhr's book, *Concerning Food Substances*: "Eggplant does not hinder the stomach, but strengthens it."[47] Most likely, Ibn Zuhr's statement is correct, for Joseph Kadans Ph.D., in his masterful *Encyclopedia of Fruits, Vegetables, Nuts and Seeds for Healthful Living*, informs us that "eggplant has been found valuable for cases of constipation, colitis, **stomach ulcers** and various nervous conditions."[48] Maimonides also presented an aphorism written by El-Tamimi, a 10th Century Cairo-based physician who was an expert on plants and their medicinal qualities. El-Tamimi's book, *The Guidebook to Basics in Food Nutrition*, proved popular with several generations of Arab and Arabized physicians, who consulted it frequently. El-Tamimi states in his aphorism that "spinach helps patients with pleurisy [i.e., inflammation of the lining of the lungs (pleura)] and those with inflammation that develops from red bile or blood."[49] Red bile, it should be pointed out, originates from bleeding in the esophagus, stomach or duodenum. Kadans lists numerous health benefits one experiences from eating spinach, with some of these benefits addressing inflammatory ("itis") conditions, thereby helping to lead one to conclude that El-Tamimi was probably right. Says Kadans: "Spinach has been found valuable for anemia, constipation, neuritis, nerve exhaustion, tumors, insomnia, arthritis, obesity, high blood pressure, bronchitis, and dyspepsia (chronic indigestion)."[50] Now, pleurisy is a respiratory affliction. Does spinach contain some ingredients that makes it effective against respiratory afflictions and diseases? The answer is "yes," with the beneficial ingredients being carotenoids. We learn this in a 2022 paper authored by Fahadul Islam and eleven co-researchers. The paper, "Recent Advances in Respiratory Diseases: Dietary Carotenoids as Choice of Therapeutics," was published in *Biomedicine & Pharmacotherapy*. Islam *et al* begin their paper by stating that "carotenoids are essential for the prevention of physiological issues, which makes maintaining excellent health easier. They are effective functional ingredients with potent health-promoting properties that are widely present in our food and linked to a decrease in the prevalence of chronic diseases, including respiratory diseases."[51] The paper's authors next point out that two important carotenoids are lutein and zeaxanthin which "exist in green and deep green herbs such as broccoli, parsley, **spinach** and Brussels sprouts."[52] Citing dozens of scientific studies in the process, Islam *et al* then discuss how carotenoids combat a whole host of inflammatory lung afflictions and diseases, such as asthma, COPD (emphysema and chronic bronchitis), lung cancer, and pulmonary fibrosis. After doing this, they conclude their study by summing up its key finding: "Some carotenoids show promise in the treatment of respiratory disorders and **may be the most effective alternative therapy.**"[53] Well, El-Tamimi, over 1,000 years ago, certainly regarded spinach to be an effective remedy for pleurisy, and now we clearly see why.

Another major medical book authored by Maimonides, *The Regimen of Health*, was completed somewhat earlier in time than his *On the Causes of Symptoms*, with the former's appearance once again occurring during Sultan al-Afdal's short reign from 1193-1196 CE. *The*

Regimen of Health contains four chapters, and Maimonides begins his work by providing the following descriptive title and introductory paragraph:

The Treatise Sent to the King al-Afdal, Son of Saladin, concerning
THE REGIMEN OF HEALTH
In the Name of God, Merciful and Compassionate

The high command of the royal al-Afdal, may God elevate and sustain him, has reached this minor Servant Mūsā ibn ʻUbayd Allāh [i.e., Maimonides], the Israelite of Cordoba. Sent by the hand of a messenger, it requests of him a regimen to be relied upon in curing the ailments that occur in our Master, may God keep ailments afar from his high abode, and may health and peace accompany him forever. The messenger bringing this exalted command relates that our Master complains of the dryness of his stools which are often so hard that they cannot be moved except with effort. He also mentioned the occasional occurrence of melancholy, evil thoughts, desire for solitude, and foreboding of death. In addition, he has had much indigestion and most of the time his digestion is feeble. This is what he mentions.[54]

In striving to attain excellent health, Maimonides informs us that one ought to prioritize breathing pure air above all else. In other words, according to him, breathing such air is foundational for the health-seeker, meaning it is more important than eating wholesome foods, regularly exercising, or engaging in other health-promoting actions. In his book's Chapter 4, a chapter whose focus is presenting general and specific advice that he classifies as being beneficial for everyone (the healthy and the sick), Maimonides states the following regarding the overriding importance of breathing pure air:

First, one ought to attend to the rectification of the air, then to the rectification of the water, and after this to the rectification of the nutrients. This is so because what the physicians call pneumas are fine vapors found in the body of living creatures; their origin and the main part of their substance are from the air inhaled from without. The vapor of the blood found in the liver and in the veins arising from it is called the Natural Spirit, the vapor of the blood found in the heart and the pulsating vessels is called the Vital Spirit, and the vapor found in the ventricles of the brain is called the Psychic Spirit. The source of all these, and most of their substance, is the air inhaled from without, and if this air becomes corrupt, putrid, or turbid, all pneumas undergo alterations and their affairs proceed contrary to what is proper.

The finer the pneuma is, the more it is altered by changes in the air. The Natural Spirit is coarser than the Vital Spirit, and the Vital is coarser than the Psychic, and if the air is altered ever so slightly, the state of the Psychic Spirit will be altered perceptibly. **Therefore you find many men in whom you can notice defects in the actions of the psyche with the spoilage of the air, namely, that they develop dullness of understanding, failure of intelligence, and defects of memory, although no change is to be noticed in their Vital and Natural actions.**[55]

Present-day scientific studies have confirmed Maimonides' contention that breathing bad, polluted air adversely affects one's mental faculties. For example, we note the findings presented in a 2018 *Current Environmental Health Reports* paper, "The Effects of Air Pollution on the Brain: A Review of Studies Interfacing Environmental Epidemiology and Neuroimaging," by Paula de Prado Bert and 4 co-researchers. At the beginning of their paper, Bert *et al* provide this overview of what existing scientific studies investigating air pollution's impact on the brain have found: "An emerging body of evidence has risen regarding the potentially harmful effects of inhaled pollutants during the last decade on the central nervous system. **Traffic-related air pollution (TRAP) exposure has been associated with adverse effects on mental development and on behavioral**

functions such as attention, reduced global IQ, a decrease in memory and academic performance, and higher prevalence of Attention Deficit Hyperactivity Disorder and Autism Spectrum Disorder. Findings from epidemiological studies also provide support for a relation of TRAP exposure to cognitive decline and dementia in the elderly."[56] Bert *et al* proceeded to conduct a thorough evaluation of the scientific studies on this subject they determined had been the best designed and carried out, and these numbered eleven. Some of these studies' alarming findings included "a consistent pattern of air pollution-related reduction in white matter [i.e., the large network of myelin-covered nerve fibers in the brain] volume was observed. Greater $PM_{2.5}$ [i.e., very tiny Particulate Matter] exposure was associated with smaller volumes of white matter of all association areas (frontal, parietal, and temporal) of the corpus callosum of the elderly. …smaller brain volumes were also observed in the elderly exposed to high levels of $PM_{2.5}$."[57] Bert *et al* wrap up their paper by stating, "**In conclusion, studies integrating environmental epidemiology and neuroimaging suggest that white matter, cortical gray matter, and basal ganglia could be targets of traffic-related air pollution (TRAP) and that these detected TRAP-induced brain damages might underlie the observed association between TRAP exposure and cognitive disorders in humans."**[58]

Not only does breathing bad, polluted air cause the type of negative neurological effects that Maimonides and Bert *et al* described, but it also can cause a person's death. In a December, 2022 World Health Organization (WHO) publication titled "Ambient (outdoor) Air Pollution," WHO reported that "ambient (outdoor) air pollution is estimated to have caused 4.2 million premature deaths worldwide in 2018. In 2019, 99% of the world's population was living in places where the WHO quality guidelines levels were not met."[59] Clearly, exposure to polluted air is harmful to one's health; so, what did Maimonides recommend a person living in or near an urbanized area do in order to minimize his or her exposure to polluted air? Here are the steps he recommends one take:

> If there is no choice in the matter, for we have grown up in the cities and have become accustomed to them, you should at least select from the cities one of open horizons, especially towards the north and the east, high in the hills or on the mountains, and sparse in trees and waters. If you have no choice and cannot emigrate from the city, endeavor at least to dwell on the outskirts of the city, facing north and east. The dwelling place should be a tall building and should have a wide court, traversed by the north wind and accessible to the sun, because the sun dissolves the putridity of the air, thins it, and clarifies it. This is fundamental in the initiation of every one of the regimens of the body or the psyche.[60]

In his book's first chapter, whose subtitle is "on the regimen of health in general, applicable to all men, in a few words," Maimonides provides interesting information with respect to milk and its qualities. He states in part: "Freshly drawn milk is a good nutrient for those in whom it does not sour in the stomach, or resolve into flatus, or give rise to ventosity in the loins. One ought to add to it a little honey with a grain of salt, as Galen has mentioned, so that it will not curdle in the stomach. **The best of all milk is the thinnest, such as goat's milk**; the milk of the she-camel is also good."[61] The "freshly drawn milk" Maimonides mentions would, of course, be raw milk—that is, not pasteurized "dead" milk, nor would it have come from some factory-farmed, stall-fed cow who had been administered antibiotics and growth hormones. But, turning to his key point, what do we know today about goat milk? Is it really the "best of all milk," as Maimonides claims? We can ascertain the answer to this question by reviewing the facts presented in a September 13, 2022 *WebMD* website article, "Goat Milk: Are There Health Benefits?" The WebMD editorial contributors relate many enlightening details about goat milk and begin their article by informing

us that "nearly three-quarters of the world's population consumes goat milk. This is partially due to the ease of keeping goats as opposed to cows in developing countries where goat milk is an important source of calories, protein and fats."[62] They then list its three main advantages over cow milk or plant milks: it's easier to digest, it's less likely to cause a milk allergy, and it provides better heart health than other types of milk. After pointing out that one cup of goat milk contains 9 grams of protein, the article's authors explain that "goat milk is an excellent source of protein, calcium, potassium, phosphorus, magnesium and Vitamin A. Studies show that consuming enough Vitamin A can help reduce your risk of cataracts, certain forms of cancer, and even help children fight off measles. Compared to standard cow milk, soy milk or nut milks, goat milk has more protein per serving. And, the goat milk protein appears to be more digestible. Goat milk also contains significantly more protein than almond milk or rice milk. Goat milk may help reduce cholesterol in people with high blood pressure. Studies have shown that goat milk can help reduce cholesterol in the arteries and gallbladder."[63] Having seen what is known today about goat milk, one has to conclude that Maimonides' very high opinion of it was merited.

Chapter 1 of *The Regimen of Health* also contains arguably the book's most important insight and advice, this having to do with indigestion. Maimonides discusses the main cause of indigestion, why it is a health problem that one should not at all take lightly, and how one can best avoid experiencing this unpleasant and potentially dangerous condition. After remarking that great physicians of the past had espoused universal precepts that, when followed, promote good health and prevent illness and disease, he expanded on this point, noting the following:

> Among these [precepts] is the statement of Hippocrates that the conservation of health lies in abstaining from repletion and forsaking the disinclination to exertion. Note how Hippocrates embraces the entire regimen of health in two dicta, that is, that a man should not surfeit himself and should not neglect exercise. This is because repletion, that is, eating until the appetite departs and repugnance commences, requires filling the stomach to the utmost of its capacity and distending it. When any organ becomes distended, its connections are loosened and its vigor is necessarily weakened. The stomach will in no wise digest such a meal adequately; indolence, feebleness of movement and heaviness of the meal will occur, and even more so when much water is drunk after the satiating meal. This is necessarily required in repletion, for nature requires water to float the meal and ease the stomach.
>
> Perforce, there is no escape from the occurrence of one of two things: either an indigestion, a severe one causing death or a mild one causing illness, or corruption of the digestion. The kinds of corruption vary greatly according to the various kinds of food eaten, according to the various temperaments, and according to the various predispositions of the organs to disease. When the meal is digested poorly in the stomach, its second digestion in all the organs will perforce be worst of all. This is the cause of all kinds of diseases in great variety. Galen has said in these words: **"He who wishes to avoid all illness should take care to avoid indigestion and should not move about after the meal."** Because of this grave danger, all physicians have cautioned against eating to repletion and ordered one to withdraw his hand from the meal while appetite still remains, before it departs, and to abstain from distending the stomach and overfilling it.[64]

The "all kinds of diseases" Maimonides says are associated with indigestion would likely include the following ones that the WebMD website's March 27, 2023 article titled "Indigestion" lists as being linked to this health problem: Ulcers; GERD (gastroesophageal reflux disease); Stomach cancer; Gastroparesis (a condition where the stomach doesn't empty properly; this often occurs in people with diabetes); Stomach infection; Irritable bowel syndrome; Chronic pancreatitis; Thyroid disease.[65] These are diseases that no rational person would ever want to have to contend with, and yet each year all too many people worldwide end up in that unfortunate position. For example, the American Society of Clinical Oncology's Cancer.Net website contains

a several-pages-long section titled "Stomach Cancer," which provides detailed statistics and information on stomach cancer. This section, dated March, 2023, presents many concerning facts about the disease such as the following: "Worldwide, in 2020 an estimated 768,793 people died from stomach cancer and an estimated 1,089,103 were diagnosed with the disease. Globally, it is the fourth leading cause of cancer deaths and the fifth most commonly diagnosed cancer in the world."[66] Unsurprisingly, indigestion and bloating of the stomach are listed in the above-described section as two of stomach cancer's symptoms.

Clearly, one would be wise to eat and prepare meals which do not cause one to experience indigestion. What therefore did Maimonides recommend a person do in order to not experience this malady? His top recommendation, as we'll see, turns out to be a familiar one to us. He tells us: "To guard against repletion, **physicians have warned against eating many dishes and recommend limiting each meal to one dish**, so that one does not overeat, and the appetite subsides before surfeit occurs. He will also be saved from a diversity of digestions, for different dishes are digested in different digestions, each dish according to its nature."[67] In other words, Maimonides recommends that one eat a mono meal (a one-dish meal). Now, as we recall, Avicenna in his masterpiece book, *The Canon of Medicine*, said much the same thing as Maimonides, stating: "A person …should not partake of food until there is a definite appetite, and unless the stomach and upper small intestine have emptied themselves of the previous meal. For there is nothing more harmful to the body than to superpose aliment upon incompletely digested food."[68] And, "to have several courses to a meal is injurious in two directions: (a) the rate of digestion is diverse, for the part that digests more speedily is admixed with a part which is not yet digested; (b) a person may eat too much of one dish."[69] Given the popularity of *The Canon of Medicine* with 11th and 12th Century Arab and Arabized physicians, one has to think that many of these doctors gave their patients the same meal-planning and indigestion-avoiding advice as Maimonides and Avicenna.

Chapter 3 of *The Regimen of Health* addresses Sultan al-Afdal's specific health complaints which included, among other things, "melancholy, evil thoughts, desire for solitude, and foreboding of death," all of which are commonly experienced by people suffering from depression. Maimonides ended up recommending that the Sultan try to alleviate his condition via a non-drug approach which we'll soon see. But, for now, can a non-drug approach help someone who is depressed? According to the American Psychological Association (APA), the answer is "yes." On October 30, 2019 APA published on its website an article titled "Mindfulness meditation: A research-proven way to reduce stress." We read the following in this article:

> Mindfulness can help treat people with specific problems including depression, pain, smoking, and addiction. Acceptance [a major component of mindfulness] involves observing one's feelings and sensations without judgment. Instead of responding or reacting to those thoughts or feelings, you aim to note them and let them go. Some of the most promising research has looked at people with depression. Several studies have found, for example, that mindfulness-based cognitive therapy can significantly reduce relapse in people who have had previous episodes of major depression. What's more, mindfulness-based interventions can improve physical health, too. Researchers believe the benefits of mindfulness are related to its ability to dial down the body's response to stress.[70]

It is understandable that Sultan al-Afdal, given his position as the ruler of a large empire (Egypt, Palestine, Lebanon, Syria, Yemen, the western half of Arabia), would be confronted daily with difficult problems involving the peoples and territory he governed that required his attention. No doubt he frequently would have had to figure out quickly how to respond to some serious

matter and just as quickly issue an order. Constantly having to put out one fire after another, so to speak, could easily stress out a person so much that the person eventually falls into a state of depression. How Maimonides decided to help the Sultan deal with his depression was to advise him to engage in contemplation, a non-drug approach similar to the practice of mindfulness. Maimonides specifically recommended the following:

> Contemplation is very good; it will reduce evil thoughts, anxiety, and distress. Often they will cease altogether if a person holds the following consideration before his mind's eye. If one reflects on something and becomes distressed by the thought, and grief, sorrow, and sadness arise in him, this can come from one of two things. Either he thinks about something that has passed, like thinking about what has befallen him from the loss of wealth that was his or the death of someone from whom he grieves, or he thinks of things that might yet happen and fears their coming, like thinking and dwelling upon what might result from the coming of adversity. Yet it is known through rational observation that thought regarding what has come and passed is of no value at all, and that sorrow and gloom about things that have come and passed are the occupation of fools. There is no difference between a man who is gloomy because of wealth that has perished, and the like, and one who grieves because he is a man and not an angel, or a star, or similar thoughts that are impossibilities.
>
> As for obsession with thoughts about what might befall in the future that lead to anxiety, these ought also to be relinquished with the consideration that everything that one might anticipate lies in the realm of possibility; it might happen or it might not happen. And just as one might grieve and sorrow over what he anticipates might occur, so it behooves him to dilate his spirit and hope, and with this hope he might perhaps obtain the opposite of what he anticipates. Indeed, that which is anticipated and its opposite are both possible.[71]

Now, it wasn't as if Maimonides wasn't under any stress himself. The incessant demands on his time from his medical practice, his serving as *Nagid* of Egypt's Jewish community, and his devoting time to writing medical works, two books of which—*The Regimen of Health* and *On the Causes of Symptoms*—he had no choice but to write on short notice at the "request" of the Sultan, led to him expressing frustration to Rabbi Jonathan of Lunel (a Jewish commune in southern France) over how he seemed to be trapped in a life not of his choosing. Bar-Sela *et al* relate the following regarding how Maimonides reached this period in his life of being discontented:

> In a letter to Rabbi Jonathan of Lunel he wrote: "Before I was formed up in the belly the Torah knew me, and ere I came forth from the womb she had sanctified me for its studies and ordained me to spread wide its fountain. She is my beloved doe, and the wife of my youth whose love I have followed ever since. Nevertheless, many foreign women became her rivals. . . and God knows that at first they were not taken except to be her anointers, cooks and bakers, to show the people and the nobles her beauty. . . Now I have become remiss in my duty to this marriage, for my heart is divided among the various sciences. . ."
>
> Among these "foreign women" medicine was the foremost, and the one most demanding of his time. He was now ailing; in that same letter he noted: "My illness lingered for nearly a year, and now that I have recovered, I am like a sick man no longer in danger. Most of the day I recline in bed with the burden of the people upon my neck, regarding matters of medicine, weakening my strength. They do not leave me alone for an hour, neither in the day nor at night, and what can I do now that my reputation has spread in many countries?"[72]

Maimonides' exhausting and often frustrating daily work duties came to an end on December 4, 1204 CE, for he died at age 69 in Fustat on that day. History does not record the cause of his death. Most reports say that it was Maimonides' wish that upon his death his body be moved and buried near the south shore of Lake Tiberias in lower Galilee, and that this supposedly was done. Serving today as a popular tourist attraction, his alleged tomb next to Lake Tiberias reads "From Moses to Moses arose none like Moses." A son of his, Abraham, reached adulthood and

ended up following in Maimonides' footsteps of holding the same positions of *Nagid* and court physician. In addition, throughout his career Abraham took on his father's critics whenever they attacked the positions and teachings expressed in Maimonides' books.

Should the final note of our discussion of the life of Maimonides be that his tomb is nowadays a tourist attraction? As you can guess, the answer is "no." Instead, we must relate what happened when Maimonides challenged the authority of medieval medicine's greatest sacred cow—Galen. This challenge appeared in the form of Chapter 25 (the final chapter) in Maimonides' *Aphorisms of Moses* book. Comprising 51 pages and containing a total of 72 aphorisms, Chapter 25, according to Rosner and Muntner (the *Aphorisms'* translators), could stand alone as its own book. The two translators provide the following summarization of this book-like chapter:

> It is extraordinarily rich in knowledge and teaching in that, unlike the other chapters, it deals less with practical medical problems and more with philosophical and ethical concepts. It contains a plea for individual experimentation and investigation (Aphorism 26), and a sharp attack on the philosophical, psychological and some of the medical works of Galen. Maimonides points out many contradictions and inconsistencies in the works of Galen and, although he was not the first to criticize Galen, the sharpness of his attack [here] as well as in the Foreword to his *Commentary on the Aphorisms of Hippocrates* was unprecedented, since Galen's views were accepted as dogma throughout the Middle Ages, a period stretching over a thousand years. This was a display of great courage on the part of Maimonides in so severely criticizing so eminent and "faultless" an authority on medicine as Galen.[73]

Rosner and Muntner direct our attention to Aphorism 26 in their above summarization of Chapter 25, describing it as "a plea for individual experimentation." So, let's take a look at Aphorism 26, and when we do, we will see Galen making a ridiculous assertion, thereby justifying his being strongly criticized by Maimonides. Aphorism 26 reads as follows:

> He [Galen] states: "The heart is the beginning and root of all the good in life. Just as the benefit of a good life is greater than that of a simple life, so too the benefit of the testicles in living beings is greater than that of the heart." This is the phraseology of this veritable sage, and this is his analogy and viewpoint.
>
> And now, inquiring and probing minds, choose [the correct interpretation], because were the heart to be excised from a living being, could he then remain alive and live a good life? That is, could he perform coitus, and see retained in himself the male sexual potential, and that no vital function be lacking at all? [This is obviously impossible.] However, if the testicles are excised, one can remain alive as we see in eunuchs. Are then the testicles then more important than the heart? This statement [of Galen's] is thus completely lacking [in validity] and is not even worthy of being concealed.[74]

A typical aphorism revealing Galen's ability to all-too-frequently contradict himself is Aphorism 18. Here we see Maimonides highlighting Galen's confusing advice to doctors about whether a caustic should be applied to a patient's chest area:

> In the second treatise of his *Comment. De Aeribus, Aquis et Locis*, he [Galen] states that "one should not apply caustic to any organ of the body, save the hands, feet, and hips." Yet, in the seventh chapter of the sixth treatise of his "*Comment. Epidemiarum*," he asserts that "for patients with wounds of the lung, one should rapidly apply caustics on their chests." This is his wording and, behold, it contradicts that which he previously stated. This requires explanation.[75]

Rosner and Muntner point out that all the sciences, including medicine, made minimal progress during the Middle Ages due to little scientific investigation and experimentation being conducted during that era. Instead, as they note, "Scholarly discussions and commentaries of dogmatic views and traditional texts prevailed. Independent observation was frowned upon, strongly condemned, not tolerated, and even outlawed by authorities of the medieval Church."[76]

Given this seemingly frozen-in-place situation, the two translators reserved special praise for Maimonides' Aphorism 69, stating, "The peak of his greatness is revealed in Aphorism 69 where Maimonides challenges authorities in general," though one can read between the lines in this aphorism and figure out that Galen is one of the authorities that Maimonides is alluding to.[77] Here is Aphorism 69:

Moses states: In an earlier aphorism I spoke of human illnesses. My intent in this aphorism is to stimulate you with some highly important advice, in your consideration of and belief in [authorities in various fields]. It is that if any man declares to you [that he has found] facts that he has observed and confirmed with his own experience, even if you consider this man to be most trustworthy and highly authoritative, be cautious in accepting what he says to you. If he attempts to persuade you to accept this opinion, which is his viewpoint, or any doctrine that he believes in, then you should think [critically], and understand [what he means] when he declares that he has observed it, and your thoughts should not become confused by those "novel stones." Rather, investigate and weigh this opinion or that hypothesis according to requirements of pure logic, without paying attention to his contention that he affirms empirically. [This is so irrespective of] whether this assertion is advanced by a single person or by many who adhere to that particular viewpoint. This is so because jealousy and lust may lead a man to shameful things, especially at a time of controversy.[78]

We recall Ibn Zuhr saying in regard to treating a stomach ailment that "even if Galen did not mention myrobalan, experience recommends it." But, the Arab and Arabized physicians who preceded Maimonides generally limited their disagreement with Galen to just matters involving a recommendation about what type of medicine to administer to a patient who was battling some sort of illness or disease. Maimonides, though, took criticism of Galen's medical writings to a whole new level. In the words of Rosner and Muntner, "Maimonides was not the first who dared to stand up in opposition to Galen but, in terms of attacking Galen's medical authority, and especially in the sharpness and poignant nature of this critique, he was certainly the first."[79] However, what Rosner and Muntner say next about Maimonides is what one most of all must remember about the man: "From all the foregoing, it is apparent that Maimonides was not a follower of medical dogma; rather he was an individual who arrived at logical conclusions after critical appraisal of a situation, and personal experimentation. **He initiated the scientific method**, and revolutionized the authoritative perfection of Galen, by pointing out the latter's imperfections."[80]

You will not find histories of science crediting Maimonides as being the person who initiated the scientific method, yet it appears that he, in fact, did or at least *attempted* to initiate the scientific method. Why Maimonides has not been given credit for this colossal achievement can be explained by the following reasons: 1) Maimonides wrote all his treatises and books in Arabic; so, one had to be able to read Arabic in order to have understood the points Maimonides made in his *Aphorisms of Moses* book; 2) one had to have read the first 24 chapters of the *Aphorisms of Moses* before finally arriving at the truly important last chapter—Chapter 25—the one containing one strong criticism after another of Galen; 3) the printing press did not exist in the 12th Century, so there would not have been many copies of the *Aphorisms of Moses* available; 4) a medieval era scholar interested in scientific subjects would likely not have thought that Maimonides, being a rabbi and a well-known author of authoritative books on Judaism, would have written much, if anything, of value with respect to the field of science, and so would not have sought out Maimonides' written works. Indeed, Rosner and Muntner state, "The medical writings of Maimonides were not widely known; most remained hidden and obscure until relatively

recently."[81] And so, just like when one wonders "Does a sound made in a quiet forest exist if no one heard it?", can it be that Maimonides proved to be one of the Giants of Science, even though no one [but you ☺ and me] knows it?

22. Who Wrote the *Regimen Sanitatis*?

As great a physician as Ibn Zuhr was, only parts of his many medical works have ever been translated into English. Wouldn't it therefore be wonderful if a complete translation into English of one of his medical books finally was produced? Michael McVaugh, Gerrit Bos, and Joseph Shatzmiller thought so, and took upon themselves the task of translating into English a manuscript believed by medieval era scholars to have been authored by Ibn Zuhr. This manuscript only existed in its Latin and Hebrew versions, the original Arabic manuscript unfortunately no longer being extant. Because the manuscript itself possessed no title, the medieval scholars bestowed upon the work the Latin title *Regimen Sanitatis* (i.e., "Regimen of Health").

Several different Latin and Hebrew translations of the manuscript existed, and McVaugh, Bos and Shatzmiller expended a tremendous amount of time and effort to determine which of these various translations best conveyed what the original Arabic manuscript would have said. What they learned is that two people, Jacob ben Machir—more commonly known by his latinized name, Profatius—and Bernat Honofredi, worked together as a team to produce a Latin translation of the *Regimen Sanitatis*, publishing it in 1299 CE. Shortly after the Latin translation appeared, Profatius produced a Hebrew translation. Both translations, but especially the Hebrew version, sometimes encountered words in the Arabic manuscript for which there was no equivalent in either Hebrew or Latin, and so the Arabic word was retained for want of a better option. Grappling with and overcoming the many challenges that they found in translating the work into English, McVaugh, Bos, and Shatzmiller succeeded in authoring an extremely informative book titled *The Regimen Sanitatis of "Avenzoar",* published in 2019. Notice that the name "Avenzoar" (i.e., Ibn Zuhr) appears in quotation marks, meaning that the work was supposedly written by him, but that uncertainty over this claim arose. We shall address later the key question: who really authored the *Regimen Sanitatis*? But, for now we'll take a look at a few of the book's most interesting and helpful teachings.

The first assertion contained in the *Regimen Sanitatis* which merits further examination is the following:

There is nothing that is so harmful to the brain as the harm caused by a bad digestion, which is the root of all illness.[1]

Can bad digestion negatively affect one's brain and mental state? Jay Pasricha, MD, Director of the Johns Hopkins Center for Neurogastroenterology, investigated this question as revealed in a 2023 article, "The Brain-Gut Connection," appearing on the Johns Hopkins Medicine website. In this article Dr. Pasricha begins by pointing out that the body contains a "second brain"—the enteric nervous system (ENS) which is comprised of 100 million nerve cells lining the gastrointestinal tract from the esophagus to the rectum. He next states that the ENS's "main role is controlling digestion, from swallowing to the release of enzymes that break down food to the control of blood flow that helps with nutrient absorption and elimination. The enteric nervous system doesn't seem capable of thought as we know it, but it communicates back and forth with our brain—with profound results."[2] With respect to irritable bowel syndrome (IBS) and other bowel problems such as constipation and diarrhea, Dr. Pasricha notes that "for decades researchers and doctors thought that anxiety and depression contributed to these problems. But our studies and others show that it may also be the other way around."[3] He explained that scientists in recent years

have found evidence that mood changes can be triggered by an irritated gastrointestinal tract which has sent signals to the CNS. "These new findings," says Dr. Pasricha, "may explain why a higher-than-normal percentage of people IBS and functional bowel problems develop depression and anxiety. That's important, because up to 30 to 40 percent of the population has functional bowel problems at some point."[4] In addition, we read in this article that "Pasricha says research suggests that digestive-system activity may affect cognition (thinking skills and memory), too."[5] In short, bad digestion can, in fact, be harmful to one's brain and mental state, which means that the Arab physician who stated this knew all about the brain-gut connection over nine centuries before Dr. Pasricha and his colleagues conducted their research!

Another interesting contention we run across in the *Regimen Sanitatis* is this one:

Things that will conserve the heart very well are good drinks like those of apple or citron rind.[6]

Since it is much easier to obtain or make apple juice than to do likewise with citron rind, we'll focus our attention on trying to learn if consuming apples or its juice confers any cardiovascular benefits. Jeanelle Boyer and Rui Hai Liu researched this matter and published their findings in a paper, "Apple Phytochemicals and their Health Benefits," which appeared in the May 12, 2004 issue of *Nutrition Journal*. Boyer and Liu reported that the Women's Health Study of 40,000 women over 7 years found "both apple intake and broccoli intake were associated with reductions in the risk of both cardiovascular disease and cardiovascular events. Women ingesting apples had a 13-22% decrease in cardiovascular disease risk. Apple and wine consumption was also inversely associated with death from coronary heart disease in postmenopausal women in a study of nearly 35,000 women in Iowa. The intakes of catechin and epicatechin, both constituents of apples, were strongly inversely associated with coronary heart disease deaths."[7] What the two researchers essentially meant when they stated that intakes of the constituents of apples (catechin and epicatechin) "were strongly inversely associated with coronary heart disease deaths" is that the more apples one eats or apple juice one drinks, the lower will be one's chance of dying from coronary heart disease. These two above findings solidly support the *Regimen Sanitatis's* author's contention that apple juice is a "good drink" which "conserves the heart"—again, a correct health hint made over nine centuries before Boyer and Liu got their corroborative paper published.

Here now is the last and perhaps most interesting advice provided in the *Regimen Sanitatis* that we'll examine:

If you wish to fall asleep, turn on your right side, while for sleeping, on the left.[8]

The Sleep Foundation, whose employees are likely the best experts when it comes to the subject of sleeping, published on its website on April 24, 2023 an article titled "Best Sleeping Positions." As you can guess, this article, written by Eric Suni, answers the question regarding the soundness of the advice for one to sleep on one's left side. In the process of answering this question, Suni provides the following useful information about how best to employ side sleeping:

More than 60% of people sleep on their side, with men spending more time on their side each night than women. As children, we split our night by sleeping in all positions equally, but by adulthood, a clear preference for side sleeping emerges. The flexibility of our spine decreases as we age, which may make the side sleeping position more comfortable for older adults. Sleeping on your side offers several benefits. It promotes healthy spinal alignment and is the sleep position least likely to result in back pain, especially when supported by pillows. Side sleeping also may reduce heartburn and snoring, making it a better sleeping position for people with sleep apnea or acid reflux.

If you're already a side sleeper, opt to sleep on your left instead of your right side. Sleeping on your right may increase pressure on your internal organs, which is why experts recommend the left for pregnant women and sleepers with acid reflux or GERD (gastroesophageal reflux disease). Sleeping on the right can intensify symptoms of heartburn.[9]

As we see, the Sleep Foundation is in full accord with the *Regimen Sanitatis's* author regarding why the preferred side for an adult to sleep on is the left side.

So, who exactly was this author of the *Regimen Sanitatis* who knew so many things about how to preserve and enjoy good health over 900 years before present-day science reached the same level of understanding? For starters, in reading the *Regimen Sanitatis*, one does not come across any anecdotes or stories that characterize Ibn Zuhr's medical writings. Even in Ibn Zuhr's first book, *Kitāb al-iqtisād* ("The Book of Moderation"), written early in his medical career, we see such lines as "I was called in to see a certain king" or "I was called to the woman of a king of one of the states."[10] Given the lack of the kind of chattiness we find in Ibn Zuhr's works, it's hard to believe he's the author of the *Regimen Sanitatis*. But, if Ibn Zuhr isn't the book's author, who could it be? Obviously, the author would have to had been a physician. It turns out that McVaugh, Bos and Shatzmiller uncovered a critically important clue as to who that other physician was. A passage in the *Regimen Sanitatis* refers to a mental illness, using the word *birsām* to identify it. McVaugh, Bos and Shatzmiller explain the significance of this word's appearance in the text:

This passage is of interest for another quite different reason, since it bears on the question of our text's Arabic origin. The author of [the *Regimen Sanitatis's*] Chapter 28—part of what we have called "Section II," the regimen putatively produced by Abū l-'Ala' Zuhr—evidently had no qualms about using the word *birsām* to refer to this mental illness, nor did he even acknowledge that there was an alternative term that important authorities insisted was correct. So it is significant that when Abū l-'Ala's son Abū Marwān ibn Zuhr drew up his great *Kitāb al-Taysir* , he included in it a chapter on phrenitis caused by heat, entitled "hot sirsām," which he began by declaring grudgingly "but if you choose you can call it simply 'birsām,' as many of our predecessors called it." Abū Marwān's [i.e., Ibn Zuhr's] own expressed preference for the name *sirsām* would seem to increase the unlikelihood that he could have been the "Avenzoar" who recommended *birsām* in Section II of our treatise, and that **judgment should probably be extended to Abu 'l-'Ala', who is known to have closely supervised his son's training and reading in medicine.**[11]

So, where we are right now in trying to solve this mystery as to the authorship of the *Regimen Sanitatis* is finding ourselves entertaining a strong suspicion that Ibn Zuhr's physician father, Abū l-'Ala', whose life we have already examined, is the person behind this interesting and helpful medical work. Does any other evidence exist which can help us figure out who wrote the *Regimen Sanitatis*? Yes, and this additional evidence is the clincher with respect to our being able to answer our original question.

McVaugh, Bos, and Shatzmiller provide an extended analysis and discussion of the fact that two main versions—what they call Version A and Version B—of the *Regimen Sanitatis* exist. Version A, of which five separate manuscripts exist, was translated, with scribes making copies of it, in 1299 CE. Each of these Version A manuscripts contain the name of Ibn Zuhr in various spellings as its author. Version B, a revision of Version A, is believed to have been translated 1319 CE, with scribes making copies of it at that time. Nine of these manuscripts exist, of which seven identify the book's author, also in various spellings, as being Abū l-'Ala'. With respect to these seven key manuscripts, McVaugh, Bos, and Shatzmiller tell us why they indicate that we should regard Abū l-'Ala', and not Ibn Zuhr, to be the real author of the *Regimen Sanitatis*:

…They specify that the "Abenzoar" in question is "Ylay Hylohaly" or "Alhohai" or "Alboaly," which is evidently a corruption of "Abū l-'Ala' [Zuhr]." Abu l-'Ala's name was not at all well known in Latin Europe—the name of his son, Abū Marwān [i.e., Ibn Zuhr] was far better known because of the fame of his recently translated *Liber teisir* [i.e., *Kitab al-Taysir*]—so **to find this evidence of the father's name here suggests that it was really part of the published translation, a kind of *lectio difficilior*, and derives from the original Arabic manuscript.**[12]

Recapping the evidence, we see no chattiness, i.e., no stories or anecdotes in the *Regimen Sanitatis*, which is something we would expect to see if Ibn Zuhr were the author. More importantly, we see in this book the word *birsām* used to describe a mental illness—a word Ibn Zuhr said was used by his fellow physician "predecessors," but not by him (he used the word *sirsām* instead). Abū l-'Ala' was definitely a "predecessor" of Ibn Zuhr, being, in fact, his father; and, of course, Abū l-'Ala' was also a physician which the *Regimen Sanitatis's* author had to have been. We see as well that 7 out of the 9 manuscripts of the *Regimen Sanitatis* which had been translated in 1319 CE specifically name Abū l-'Ala' as the book's author.

Given the preponderance of the evidence, we can confidently state that the author of the *Regimen Sanitatis* is not Ibn Zuhr, but rather is none other than:

"The Wizard of Al-Andalus," Abū l-'Ala'

23. Recommendations and Sayings of the Greatest Preventive Medicine Doctors Who Ever Lived

Haris bin Kalda

Excess of diet is the cause of all disease. Diet should be at the plainest.

Al-Tabarī

No one should practice medicine unless he is adorned with generosity, kindness and devotion, and is not driven by greed.

Life is short and knowledge long, opportunities are fleeting, time is passing, experiences are perilous and destiny is strict.

Al-Kindī

Nothing should be dearer to the seeker of truth than the truth itself, and there is no deterioration of the truth, nor belittling either of one who speaks it or conveys it.

One must never be afraid of new ideas, no matter the source. And we must never fear the truth, even when it pains us.

Rhazes

Experience is of more use than a physician.

When you can cure by regimen, avoid recourse to medicine; and when you can effect a cure by means of simple medicine, avoid employing a compound one.

With a learned physician and an obedient patient, sickness will disappear.

Whenever a prevailing theorem and a real fact are contradictory, the latter is to be accepted as true, no matter how wide the extent to which the theorem is acted upon.

Haly Abbas

A physician should try to treat his patient by food or medicine. The treatment of a patient should not be for the sake of raising money, and the medical action should not be for the sake of recompense and reward. The physician should never advise anybody to use dangerous and harmful medicine, and he should not even describe these kinds of drugs.

A physician should be merciful, chaste, kind, benevolent and well-spoken. The physician should try to cure all patients, the poor and indigent as well. He should not think of profit and reward from this group of helpless people at all.

Avicenna

A person should not partake of food until there is a definite appetite, and unless the stomach and upper intestine have emptied themselves of the previous meal. For there is nothing more harmful to the body than to superpose aliment upon incompletely digested food.

No meal should be bulky enough to completely satisfy the appetite. One should rise from the table while some appetite or desire for food is still present. For such remnants of hunger will disappear in the course of an hour.

The art of maintaining health is not the art of averting death, or of avoiding extraneous injuries, or of securing the utmost longevity possible to the human being. It is concerned with two things: 1) the prevention of putrefactive breakdown; 2) the safeguarding of innate moisture from too rapid dissipation, and maintaining it at a degree of strength that the original type of constitution peculiar to the person shall not change even up to the very last moment of life.

Al-Samarqandi

The physician should not treat everything of a minor character or a small change occurring in the body with a drug. Rather, he should treat it by changing the method of management and by adjusting the necessary basic conditions. He must not stir up anything nor impair the body in its natural functions. It is more difficult to quiet the stirring than to stir the quiet.

Clear water is the most useful drink for those afflicted with a sharp fever, for it possesses a strong gentleness, is quickly penetrative and has a lightness in nature.

When we can treat with foods that can act as drugs, we should not treat with drugs, and if we are compelled to do so, we should use drugs that act as foods. If recourse is had to pure drugs, we should not go beyond those that are simple, as far as possible, for that is easier for the nature of the patient to bear and more effective in the illness.

Isaac Judaeus

The physician does not make the cure. He merely prepares and clears the way for Nature, who is the real healer.

There are diseases the treatment of which consists merely of your forbidding the patient to continue his bad habits.

In treating mild diseases do not rush to change the temperament or to use purgatives, since usually Nature alone will suffice, with the aid of a good regimen.

Whenever you can accomplish the treatment by means of diet and curative foods, do not use drugs, because most of them are enemies and opponents of Nature, especially the cathartics.

Be eager to visit and treat the needy, for no virtuous act is greater than this.

The wise man has said: "If you see a physician immediately give opinions and forever boast of his cures in any disease for which you consult him, regard him as a fool."

Ibn al-Nafīs

If the patient can take food instead of any drug, it is strongly advisable.

Throw light on and stand by true opinions, and forsake those which are false and erase their traces.

Al-Zahrāwī

Surgery should never be undertaken until there is proof that the usual treatments are not effective. Under no circumstances should an operation be performed in desperation, since surgery is only allowable if the condition of the patient makes it likely that the outcome will be successful. If the physician has not recognized the nature of the illness beforehand, and has been unable to determine its true cause and still harbors the least doubt in his conscience about it, then it is a crime to attempt an operation, which may endanger the life of his fellow-man.

Keep away from anything which may negatively affect your reputation in this life and the hereafter.

Before practicing [medicine], one should be familiar with the science of anatomy and the functions of organs so that he will understand them, recognize their shape, understand their connections, and know their borders. Also, he should know the bones, nerves, and muscles, their numbers, their origin and insertions, the arteries and the veins, their start and end. These anatomical and physiological bases are important, and as said by Hippocrates: "There are many physicians by title, but few by practice."

Abū l-'Ala'

There is nothing that is so harmful to the brain as the harm caused by a bad digestion, which is the root of all disease.

If you wish to fall asleep, turn on your right side, while for sleeping, on the left.

Ibn Zuhr

If a patient falls into a state of collapse without the physician knowing until it occurred and without his having predicted it, then this physician is undoubtedly responsible for the patient's death.

Hippocrates talked about striving to help the patient. If you cannot help him, at least do not harm him.

Experimentation is the only way to prove truth and dismiss fallacy.

Averroes

Ignorance leads to feat; fear leads to hate; and hate leads to violence. That is the equation.

When a physician treats a patient in any way at all, he is really assisting nature according to a determinate course of action and towards a determinate goal. That goal is either of the same type as the disease or that of health. If the physician is ignorant of that course or that goal and treats the patient in a haphazard way, he will essentially be at fault and is right only by accident.

Women should be treated as human beings, not as domesticated animals.

Maimonides

Concern and care shall always be given to the movements of the psyche. These should be kept in balance in the state of health as well as in disease and no other regimen should be given precedence in any wise.

When a meal is digested poorly in the stomach, its second digestion in all the organs will perforce be worst of all. This is the cause of all kinds of diseases in great variety. Galen has said in these words: "He who wishes to avoid all illness should take care to avoid indigestion and should not move about after the meal." Because of this grave danger, all physicians have cautioned against eating to repletion and ordered one to withdraw his hand from the meal while appetite still remains, before it departs, and to abstain from distending the stomach and overfilling it.

Contemplation is very good; it will reduce evil thoughts, anxiety, and distress.

To guard against repletion, physicians have warned against eating many dishes and recommend limiting each meal to one dish, so that one does not overeat, and the appetite subsides before surfeit occurs. He will also be saved from a diversity of digestions, for different dishes are digested in different digestions, each dish according to its nature.

If any man declares to you that he has found facts that he has observed and confirmed with his own experience, even if you consider this man to be most trustworthy

and highly authoritative, be cautious in accepting what he says to you. Investigate and weigh this opinion or that hypothesis according to requirements of pure logic, without paying attention to his contention that he affirms empirically. This is so because jealousy and lust may lead a man to shameful things, especially at a time of controversy.

One should not consume all that the palate lusts for, like a dog or an ass, but should eat things that are beneficial to the body, whether they are bitter or sweet; and he should not eat things which are harmful to the body even though they may be sweet to the palate.

It is forbidden for a man to conduct himself to use words of flattery and seduction. And there should not be one word spoken and another in the heart; rather, the internal should be as the external, and the matter in one's heart should be that which one enunciates with the mouth.

Many, if not most, of the Arab and Arabized Physicians

I will apply dietetic and lifestyle measures to help the sick to my best ability and judgment. I will protect them from harm and injustice. [The original Hippocratic Oath]

24. Appendix

The Rise and Decline of the Arab Civilization During the Middle Ages

The Court of the Lions at the spectacular fortress-palace of the Alhambra in Granada. A UNESCO World Heritage site, the Alhambra is considered by many to be the world's most beautiful building, and is one of many architectural and artistic wonders created by the Arab Civilization during the Middle Ages. The Alhambra was constructed during the Emirate of Granada. Founded in 1230 CE and ruling over territory corresponding to the modern-day southern Spain provinces of Granada, Alméria and Málaga, this emirate was the last Muslim state in Al-Andalus, falling in 1492 CE to the Catholic Monarchs, King Ferdinand II of Aragon and Queen Isabella I of Castile.

To better understand how so many outstanding Arab and Arabized physicians came into being during the Middle Ages, we shall first review the favorable social, economic and political conditions that initially prevailed in the territories under the control of the Muslims. We then will follow this up with a review of the opposite type of conditions which, once in place, hindered progress and led to the decline of the Arab Civilization.

Triumph of the Arab Genius

How excellent a recompense
For those who work and strive. (Koran 3:136)

Islam, the dynamic new religion founded by Mohammed, supercharged the 7th Century CE Arabs like nothing else. Having overwhelmed all opposition within Arabia, the Muslims next took on simultaneously the two world powers, the Byzantine Empire and the Persia-based Sāsānian Empire. This seemingly hopeless endeavor owed its origin to the achievement orientation of Islam. Islam's emphasis on accomplishment is a point several Eastern scholars have noted. For example, Amir Shakib Arsalan observes that "Islam is not a religion that fosters idleness and inactivity. On the contrary, it is a religion which inspires man to a life of intense activity and constant striving."[1] To the early followers of the Prophet this was certainly true. They took to heart the Koran's counsel "that man can have nothing but what he strives for." (Koran 53:39)

Abū Bakr, the first successor to Mohammed, died of a fever after two years as Caliph. Before he died, Abū Bakr appointed 'Umar ibn al Khattāb to succeed him. This decision made August 23, 634 CE paved the way for the most glorious days of Islam.

The Caliph 'Umar, though humble and pious in every respect, thoroughly controlled the affairs of his domain. For example, 'Umar replaced army commanders at will, and they obeyed without a whimper. He also was a tireless administrator; no problem proved too small for his personal attention. Described as being very adept and conscientious as well as caring for the average citizen, 'Umar, in short, served as a model leader.

Almost two years to the day after 'Umar began his rule, the Arabs eliminated a huge Byzantine army in northern Jordan. This Byzantine army, hastily raised by the emperor Heraclius to check the Muslims, was composed of Greeks and Armenians. Unfortunately for the Byzantines, the Greeks and Armenians were far from friendly with one another. Not realizing that his troops could not handle dealing with another negative battlefield condition, Theodorus, the Byzantine commander, ordered his soldiers to adopt a defensive position in the mountainous Deraa gap area. Days and weeks passed. The Arabs conducted several successful sorties, while all the Byzantines did was sit on their hands. Theodorus's "no win" policy only succeeded in demoralizing the Greeks and Armenians, heightening the friction between the two. At last on August 20, 636 CE the Arabs mounted a full-scale attack. A hot desert wind had come up, blowing right into the faces of the Byzantines. Theodorus's men could hardly see; plus, they had already lost their fighting spirit. The Arabs exterminated them. No survivors. Called the Battle of the Yarmouk, this was the pivotal engagement for the Caliphate against the Byzantines. Within eight years the Arabs ruled over Syria, Armenia, Egypt and Palestine—all former territories of the Byzantine Empire.

Seven months later, in March, 637 CE the Arabs pulled off another stunner after deciding to attack the vast Sāsānian Empire, which controlled Persia and large areas of surrounding territories. The occasion was the Battle of Qādasiyyah, an inevitable showdown between two fine armies. One was the Sāsānian army, estimated to be 60,000 strong; composed mainly of well-trained Persian soldiers, they were commanded by the veteran Rostam. The Arabs, numbering about 30,000, made up the other army; they were led by Sa'd ibn Abī Waqqās, a cousin of the Prophet. Rostam did not wish to risk a confrontation with the Arabs. However, the Sāsānian Empire's ruler, King Yazdegerd III, caving in to public opinion, overruled his wise general and ordered Rostam to fight. And so, a wild four-day slugfest commenced on the banks of the Euphrates. It was essentially an even contest; but, the Arabs turned the tide by launching a surprise assault during the third night (called the "Night of Fury"). Interestingly, Sa'd's men attacked on their own that night, without orders from their commander. By taking the initiative without waiting for "official approval," the Arabs attained a victory that no amount of planning could have produced. The surprise attack pushed Rostam's troops over the edge as they completely collapsed early the next day. Their losses amounting to 30 regiments, the Persian army was no more. The Muslims swept into Ctesiphon, the capital city of Persia, and in the following years inexorably conquered the rest of the Sāsānian Empire's far-flung domains, attaining by 651 CE full control over territory which includes modern-day Iran, Azerbaijan, eastern and southern Iraq, southern Turkmenistan, western Afghanistan and southwestern Pakistan.

The conviction that God was on their side clearly motivated the Arab soldiers to fight tenaciously. This indispensable belief started the ball rolling. The resulting victories made the Arabs even more unbeatable. Having developed pride and a winning tradition, they expected to emerge victorious every time out; and, with their defending champion mindset, they hated to lose the title, so to speak. In this respect the Arabs resembled certain famous US college football teams, such as the Alabama Crimson Tide, renowned for their competitiveness and unmatchable won-loss records.

An important side discussion is in order here. The Arab army hardly ever suffered low morale. This was largely due to the fact that whole tribes were sent to the front. This meant that young men fought alongside their fathers, uncles, cousins and friends. Everyone knew, if not loved, each other. So, in the Arab army there was solidarity, besides the sense of mission which Islam provided. By contrast, there was nothing inspirational at all about having to serve in the Byzantine or Sāsānian army. For one, the focus of the rulers of these empires was on maximizing and preserving their power, using and manipulating their armies to this effect. Secondly, and just as importantly, these armies were composed of conscripts—men who were complete strangers to one another. In other words, a soldier in these armies would see that "the other guy" serving next to him often belonged to a different ethnic group which, of course, possessed its own unique language and culture. This "internationalization" of the Byzantine and Sāsānian armies led to limited acts of courage on the battlefield, for the soldiers, by possessing little in common, rarely came to the aid of each other in difficult moments. That the average 7th Century Greek and Persian soldier went through the motions, but no further, is understandable and, after all, human nature.

Now, the economic consequences of the Arabs' conquest of Persia and the rest of the Sāsānian Empire were profound. When the Muslims marched into Ctesiphon, they captured King Yazdegerd III's incredible fortune. "According to some historians, the cash was assessed at 300

billion dinars."[2] The dinar was the gold coin of the Arabs, weighing somewhat over 1 ounce. We'll leave the calculations to you as to how much 300 billion gold dinars would be currently worth. The Arab soldiers retained most of the booty. But, 1/5th of the spoils went to the Caliph; this was the policy, originally established by Mohammed. 'Umar could have enriched himself enormously from the Ctesiphon windfall; he distributed the wealth to his countrymen, though, as soon as it arrived.

Meanwhile, more and more money from the conquered lands flooded into the hands of 'Umar and his advisors, which they passed on to the poor. This income came in the form of tax revenues, primarily from the land tax. 'Umar had "refused to distribute land among army officers. He declared all land as public property and left it with the former cultivators on payment of a certain sum annually as land revenue."[3] This land reform measure proved to be a stroke of genius on 'Umar's part. The peasantry, who had deserted the rural areas in great numbers because of slave-like conditions and over-taxation by the Byzantine and Persian authorities, returned. The tax rate the Arabs charged was easily within everyone's means. Farming therefore became profitable again. In a short time the farmers' standard of living was higher than it ever had been. Umar made certain this remained the case by keeping taxes to a minimum. The Caliph well understood that high taxation discourages individual initiative and stifles the economy in general. History has recorded one inquiry 'Umar made to his tax collectors about the tax rate in Iraq:

> "Perhaps you assessed the land at a rate which it cannot stand," and they replied, "No, on the contrary, we have assessed it at a rate which it can stand, although if we had assessed a higher rate the land could still stand it."[4]

'Umar also lowered tariffs and did everything he could to promote free trade. This was because honest trade was considered "a form of service to the community, and therefore to God. Hence, no hindrance in the freedom of trade was allowed."[5] It follows that many cities in the Arab Empire annually held trade fairs.

After a while 'Umar and his advisors had difficulty finding enough poor people in Arabia to give government revenues to. However, this pleasant problem ended for a brief period. In 639 CE a famine broke out in Arabia. As related by 'Allama Nadvi in his book, *The Arab Navigation*, "'Umar wanted to have corn from Egypt. But it took a long time to import it to Arabia through the land route. 'Umar therefore had a canal of sixty-nine miles dug from the river Nile to the Red Sea."[6] The governor of Egypt, 'Amr ibn al-'Ās, oversaw the project, rushing the canal to completion. In six months the canal was ready; within a year 20 ships bulging with corn reached Jar, the port of Medina. This new link between Egypt and Arabia broke the back of the famine and it also stimulated trade between the two lands for over 100 years. One can imagine how a similar undertaking would fare today. Such an idea would first have to have one or more complicated, time-consuming environmental impact reports prepared as well as possibly endure one or more lawsuits (which alone could add years to the project). Then, once the project had somehow overcome these hurdles and found its way through the usual regulatory maze, allowing for construction to finally commence, massive cost overruns, strikes by the workers, and general foot-dragging by all concerned could easily rear their heads, transforming the project into an endless nightmare.

On November 3, 644 CE 'Umar was stabbed to death in Medina by a Persian carpenter who had become embittered over his fellow Persians' defeats at the hands of the Arabs. 'Umar's

ten years as Caliph are rightly regarded as the golden era of Islam. That is why to this day he is referred to throughout the Islamic world as **'Umar the Great**.

The Arab Empire still expanded after 'Umar's death, though more slowly. Political dissensions amongst the Arabs resulted in the capital being moved from Medina to Damascus. The pious Caliph became a thing of the past. The new rulers, called the Umayyads, were "strong and singularly capable rulers, bad Muslims and good men of the world, seldom cruel, plain livers if not high thinkers."[7] However, most Muslims considered the Umayyads "blood-thirsty typrants."[8]

The Umayyads remained in power until 750 CE. During their rule the economy of the Arab Empire continued to impress financial analysts and attract investors. One observer wrote of the port of Aden's favorable investment climate that "if a man comes here with one thousand dirhams (silver coins), he goes back with one thousand Ashrafi (gold coins), and one hundred is sure to be multiplied into five hundred."[9] Aden, Basra and other Arab ports flourished because "commerce was left to private enterprise."[10] This free trade economic environment encouraged the Arabs to engage in worldwide business ventures. For example, we know that Arab traders regularly visited Japan, China, India, Madagascar, Ghana and Bohemia. More unexpected, though, is the discovery of Arab coins dating from 685 CE to 705 CE in Scandinavia, Britain and Iceland! More and more historians have come to recognize that the medieval era Arabs were outstanding seafaring merchants. Favorable conditions, in particular their government's free trade policies, made it well worth the Arabs' while to travel great distances as tradesmen. John Bagot Glubb in his book, *Peace in the Holy Land*, presents a remarkable picture of the Arab sea trade:

> The Arabs had taken over the Far Eastern trade and developed it. Theirs were the largest and best ships plying to China and Indonesia. Their merchants had reservations in Canton and on the shores of India, as the Europeans had until recently in Shanghai. Under their highly developed banking system, an Arab businessman could cash a cheque in Canton on his bank in Baghdad.[11]

Over time the Arab Empire became more cosmopolitan. The Umayyads were overthrown by the Abbasids, skillful propagandists who claimed descent from Abbas, the uncle of the Prophet. The Abbasids drew their support from the Persians, and in recognition of this shifted the capital to Baghdad. The Empire now assumed a more Eastern outlook. Persians occupied most government posts; Turks comprised the army. The Arabs were relegated to commercial and scientific pursuits, outlets they took full advantage of.

It is impossible to mention all the scientific breakthroughs the Arabs achieved under the Abbasids, particularly during the years 754-847 CE. It is instructive to look at one, though. Al-Nazzam (died 845 CE) was a biologist. He "propounded a theory of evolution, according to which Adam and all his descendants, though created by God at one and the same time, appeared in succession at their appointed times in accordance with a preordained plan."[12] Al-Nazzam's star pupil, al-Jāhiz (died 868 CE), advanced his master's teachings much further. He wrote a book which discusses natural selection and specifically "refers to the struggle of animals for existence, and their adaptation to environment."[13] Al-Jāhiz's ideas on evolution and natural selection were developed ***1000 years*** before Charles Darwin published in 1859 CE his book, *On the Origin of Species by Means of Natural Selection*!

For a long time the scientific spirit amongst the populace was welcomed, if not encouraged, by the various Abbasid Caliphs. It is hard to say for sure whether this scientific spirit originated at

the grass roots level and the Caliphs merely gave it their blessing, or if the Caliphs actively promoted science, with the citizenry finally becoming interested in it as well. Whatever the case, an "age of enlightenment" resulted; the wide extent of this development is evidenced by the fact that "the Arabs and Muslim intelligentsia in general were aware of the sphericity of the earth."[14] Under the Caliph al-Ma'mun (813-833 CE), whose personal physician, we recall, was al-Kindī, Rationalism of the Mu'tazilites became the state religion. The Mu'tazilites "stood for insisting that the Koran was created,"[15] and not the very Word of God (uncreated). Al-Ma'mun's sponsorship of this relaxed theology removed any remaining barriers to the public's satisfying its gigantic appetite for knowledge. Only the European Renaissance equals this period in scope and intensity of intellectual activity in all fields, from the sciences to the arts. As Reynold Nicholson remarks in his book, *A Literary History of the Arabs*, "It seemed as if all the world from the Caliph down to the humblest citizen suddenly became students, or at least patrons, of literature."[16]

It was only natural that schools and colleges proliferated during the first one hundred years of Abbasid rule. Supposedly, there were 73 colleges in Damascus, 40 in Baghdad, 74 in Cairo, and so on. However, we should not assume the existence of so many schools and colleges meant that much useful learning was taking place. After all, public schools are in virtually every community in the United States, and the job they do in "teaching" children is disheartening to think about, as evidenced by the results of the 2022 National Assessment of Educational Progress test. This test, administered to students nationwide in the US, found that in 2022 only 26% of 8th graders were proficient in Math, meaning that 74% of 8th graders were *not* proficient in Math. Similar dreadful results were found for Reading. 31% of 8th graders were proficient in Reading while only 30% of 4th graders were proficient in Reading.[17] Under the Abbasids the Muslim schools that younger and teenage students attended offered primarily courses on the Koran and allied religious subjects. This was because "subjects unrelated to the Koran were regarded as being too secular to teach to the children."[18] The classes were large and the students learned by memorizing. Also, the students' written assignments consisted of commenting on the work or books of someone else. This type of education thoroughly stifled creativity and originality; as a result, few exciting ideas emerged from these schools.

It turns out that the real learning at the time, as it has occurred each day throughout history, took place off to the side, so to speak. Bayard Dodge, in his book, *Muslim Education in Medieval Times*, points out that in the medieval-era Arab Empire "many individual scholars studied philosophy, astrology, astronomy, geometry, medicine, pharmacy, and certain aspects of the natural sciences, as well as alchemy, but these subjects were as a rule taught by private teachers in their homes or else in the hospitals."[19] This private education setup contains numerous advantages, some of which include: 1) the teacher-pupil ratio is ideal, usually 1 to 1; 2) the student learns in a comfortable, quite setting—generally the home; 3) the student can contract to learn any subject he or she wishes, and doing this helps the student to much more quickly determine the field he or she wants to pursue as either an occupation or to learn in greater depth; 4) the teacher *guides* the student, instead of lecturing to the student. In short, this personalized type of education, not only helps maximize the student's interest in the field under study, but also greatly shortens the time it takes for the student to master the subject matter. We see evidence of this in the histories of the many outstanding Arab or Arabized physicians whose lives we've examined earlier. We recall, for example, that Al-Zahrāwī, "The Father of Modern Surgery", was taught medicine by his father,

Abbas, while Ibn Zuhr, "The Father of Experimental Surgery", quickly learned his trade from his father, Abū l-'Ala', and began practicing medicine while still just a teenager.

Baghdad, the center of the Arab Renaissance, was truly a "fairy tale city." Located on the banks of the Tigris, over 2 million people resided there during al-Ma'mun's reign. One's eye could not look in any direction without seeing vast gardens. Affluent suburbs stretched out for miles. 9th Century CE Baghdad, and especially the palace of the Caliph, was the setting for many stories comprising *The Arabian Nights* (also called *The Thousand and One Nights*). The popularity of *The Arabian Nights* may be more due to its depiction of reality than its romanticizing. As John Bagot Glubb notes in his book, *The Empire of the Arabs*, "One of the most remarkable features of the Arab Empire, especially under the Abbasids, is the extraordinary profusion of gold. Not only did the caliphs use it for coinage, but it seems to have been plastered over their weapons, the bits and buckles of the bridles of their horses and on their belts. They ate and drank out of gold and silver vessels and many of their utensils were inlaid with gold. At the same period, gold was almost unobtainable in Western Europe."[20]

Implausible as it seems, the Arab Civilization's most spectacular development occurred not in Baghdad, but rather in Spain. We have already seen earlier in the chapter on "The Arabized Physicians of Al-Andalus under the Umayyad Caliphate" how this came about. What also needs to be mentioned is that around the same time as the Arabs and Berbers were developing the Iberian peninsula into a prosperous land, a small band of Muslims departed northwards from Barcelona into France, eventually establishing perhaps history's most unlikely and remarkable nation. In reading the following story as recounted by Arsalan, we gain a good understanding of why it was the Arabs' very high level of energy and efficiency which not only allowed them to create an unparalleled advanced society in Spain, but also allowed them to successfully defend themselves for a very long time against enemies:

> There is a well-known story in the history of the early Muslims, how a small band of twenty Muslims moved themselves from Barcelona to Fruxina, a coastal place in France where they took possession of a hill and constructed a fort on it, and how they founded a small government in course of time when their number increased to about a hundred. The blaze of this government authority subsequently spread itself over the southern parts of Italy, resulting in a treaty between them and the rulers of these places. Gradually they settled down in the Alps mountains and captured the mountain pass that joins Italy to France, whereupon the Europeans were obliged to pay them road tax whenever they passed that way. Subsequently this small Arab kingdom progressed very much. It extended its boundaries right up to Lake Constanza in Switzerland and included even part of Switzerland under its dominion. It was not until ninety years after the foundation of this state, that this small nation was destroyed by the repeated invasions of the united forces of several European powers. At the time of the fall of this State, the Muslims numbered only fifteen hundred.[21]

The laissez faire economic and social conditions operating for most of the time in Spain while under Muslim rule permitted each citizen to freely pursue and perfect one's interests and enjoy rich personal growth. It is no surprise then that Muslim Spain produced numerous geniuses. Abbās ibn Firnās definitely qualifies as one of the most unique of these brilliant minds:

> He is said to have made the first successful attempt at soaring flight (i.e., flight without the aid of artificial power), putting on a suit of feathers and wings; but after flying a long distance hurt himself in alighting, for want of a steadying tail.
>
> Ibn Firnās is credited also with the building of a planetarium showing stars and even clouds and lightning.[22]

In the arts, especially in the field of poetry, great masters appeared on the scene time and again in Muslim Spain. Their works set new standards of excellence, standards which few poets since have ever matched, let alone exceeded. Ibn Khafaja (1058-1138 CE), whose life overlapped that of Abū l-'Ala' and the first half of Ibn Zuhr's life, exemplifies the high level of sophistication permeating Hispano-Arabic poetry. A master if nature poetry, we shall look at a small portion of a poem he wrote about what a traveler heard while resting overnight next to a mountain. The traveler heard the mountain saying:

"Lo, for how long will I be the shelter of murderers and the abode of sorrowing penitents devoted to God's service?

And how many times have travelers going off at night and returning by day passed by me, while riding beasts and riders have taken their siesta in my shade,

And contrary winds have lashed at my flanks while the green seas have dashed against my sides!

And all this took place only in order that the wind of death might enfold them and so that the wind of separation and misfortune might carry them off in flight!

The quivering of my groves is but the panting of a feverish chest struggling for breath, while the mourning of my doves is but the wail of one lamenting the dead.

Nor has consolation restrained my tears; rather, I have exhausted my tears in separation from my companions.

Until when will I remain behind when a dear one travels away, saying farewell to him when he departs never to return?

Hence show merciful compassion, O my lord, for the plea of a humble entreater, who extends a supplicating hand toward your blessing."[23]

James T. Monroe, author of *Hispano-Arabic Poetry: A Student Anthology*, observes that this poem by Ibn Khafaja is filled with "hauntingly beautiful language, and expresses a feeling of universal alienation."[24] He continues, "A mountain endowed with human attributes is mourning over its unrequited love and complaining that its lovers, the travelers who pass by it, always depart from it never to return. The mountain, a proverbial symbol of stability in Arabic poetry, here becomes a symbol of the instability of love and of universal loneliness."[25] Without belaboring Monroe's analysis, it can be said that a better treatment of the crushing effects broken loves have on one's psyche is hard to imagine; and, such poignant treatments are more the rule rather than the exception in the poems of Ibn Khafaja and many of the other Arab poets of Muslim Spain.

This is a good time to pause, with the Arab Civilization at its most magnificent, and recall some of the factors which helped the Arabs create a new order during the Middle Ages. A useful condensation of these factors can be found in the observation by the great 19th Century French social psychologist, Dr. Gustave Le Bon, who said this in regard to the Arabs' success: "The Arabs did not absorb any of the influences of tradition which weighed so heavily on the Byzantines. This liberty of spirit was one of the causes of their rapid development."[26] Liberty of spirit is reflected and manifested in many ways, such as low taxation rates, free enterprise/free trade, flourishing businesses, private education, religious freedom/tolerance, scientific and medical discoveries, artistic masterpieces, and a strong work ethic. Whenever the Arab Empire's ordinary citizens and their rulers embraced the sound policies and principles which facilitate the above conditions and outcomes, the triumph of the Arab genius was never in doubt.

Disheartening Decline of the Arab Empire and its Civilization

In seeking the various causes of the decline of the Arab Empire and the remarkable civilization it brought into existence, perhaps all of them could simply be summarized by what Arsalan had to say in his book, *Our Decline and Its Causes*, who stated the following:

Degeneration of national character is the true cause of a nation's decadence and religion cannot be held responsible for it.[27]

As we examine in greater detail the causes of the decline of the Arab Empire and its resulting civilization, we will see several instances of the above, that is, how a weakness in the Arabs' moral fiber and character preceded and/or coincided with major setbacks experienced by the Arabs. To best appreciate Arsalan's contention—that "degeneration of national character is the true cause of a nation's decadence"—let us go back to the starting point.

The Prophet Mohammed lived most spartanly, dying penniless, and his example was not lost on his followers. The Companions of the Prophet emulated Mohammed's simple lifestyle, donating all their energies and money towards the propagation of Islam:

> Their houses were free from costly furniture. They lived most frugally and did not think of hoarding wealth. They were conscious of the fact that luxurious living destroys the strength of a nation as well as of an individual. It was really this hard living which was the secret to their success in war and peace.[28]

Such self-sacrifice, as we have already seen, propelled the 7th Century CE Arabs to great conquests over the Byzantine and Sāsānian empires. As a result, immense revenues in the form of booty and taxes poured into Medina, the Arab Empire's initial capital. The Muslim political leadership puzzled over how to best distribute this wealth to the Arab populace so that everyone would be happy. In fact, the question these decision-makers should have asked themselves was: "Is it in the best interest of the public to receive all this money, especially when they have done little or nothing to earn it?" Already self-sacrifice was giving way to the temptation to self-indulgence.

The Caliph 'Umar, second Successor to Mohammed, received very poor advice on this matter. One advisor, Uthmān ibn 'Affān, noted, "People are getting wealth in heaps, and if you do not know its amount and how much each one has received, the whole system will be disturbed."[29] Another official, Al-Walīd ibn Hishām, told 'Umar, "I have seen the kings of Syria enter people's names in registers. You should adopt the same manner."[30] 'Umar liked this advice and came up with a plan to provide *all* Muslims—from babies to the retired—regular allowances. His "cradle to grave" benefits program was even more comprehensive than the welfare and social security systems many Western nations possess today. Before putting this measure into operation, however, 'Umar held public hearings on the proposal. The citizens of Medina were invited to make comments, and nearly all who attended the hearings hailed the plan. Only one man—Hakim ibn Hazm—objected. Hakim clearly saw that the handout scheme would make his countrymen soft. Little is known about this visionary. It appears, though, that Hakim knew his warning regarding what would happen to the Quraysh, the large group of Arab clans which inhabited and controlled Mecca and its Kaaba, would be ignored; but, he made his speech anyway. "Amir al-Mu'minin!" he reverently addressed 'Umar, "the Quraysh are tradesmen; if you give them allowances, they will abandon trade. A time might come when their ruler would stop their allowances; their fate

could then be well imagined, they already having ceased to be traders."[31] Hakim failed to convince 'Umar to scrap the program; the Caliph gave the go-ahead. Nonetheless, 'Umar himself saw that this Socialist ideal of a guaranteed annual income for all would work only under certain circumstances. He often urged his people, "The poor Arab, when he gets the allowance, should buy goats. When he receives it again, he should add cattle to his herd, because I fear that after me people who will be your amirs will not give you allowances. If some of you are alive at that time, you should have enough capital to spend your life easily."[32]

Hakim's prediction and 'Umar's premonition came true, as Irfan Ra'ana explains in his book, *Economic System under Umar the Great*:

> Allowances made the Arabs lazy and they became careless to earn their livelihood. When the period of victories was over and the non-Arabs entered the Muslim governments, i.e., when the capital of Islam shifted from Medina to Damascus and then from Damascus to Baghdad, the allowances of the people of the Arabian Peninsula were totally stopped. The nation brought up in a climate of laziness and gaiety could neither turn to trade nor bear hardships to earn their livelihood. The result was that the Hejaz became sterile and has never been able to regain its lost vitality.[33]

Outwardly, Arabia prospered during the Caliphate of 'Umar and his successor, Uthmān. A slow rot set in, though, in the people. As years passed, a whole generation began growing up who knew about Mohammed only through stories. The intense "religious rush" that the Prophet personally inspired during his lifetime could not be sustained twenty years after his death as material comforts, instead of tales about Mohammed, attracted the new, younger Muslim generation. As Nicholson observes, "The rapid growth of luxury and immorality in the Holy Cities as well as in the new settlements was an eyesore to devout Muslims."[34]

'Umar's successor, Uthmān, was a kindly old man in his 70s, really too old to govern. Unable to foresee the obvious repercussions, Uthmān naively appointed his relatives to the most important government posts. This nepotism created so much jealousy amongst the Arabs that a civil war eventually broke out. The Governor of Syria, Mu'awiya, won the war. He proclaimed himself Caliph and in 661 CE moved the capital to Damascus. This marked the start of the Umayyad dynasty. The Umayyads remained in control for over 90 years, and under them the deterioration of the moral fiber of Muslim society increased.

The Battle of Tours in 732 CE is widely regarded as the disastrous high-water mark of Islam. The Arabs, as we recall, had conquered Spain two decades earlier and now wanted to add France to their empire. Accordingly, an army of 80,000 Muslims stormed into southern France and made their ways northward. This invasion force was commanded by a man known to Europeans as Abderrahman. The commander was highly esteemed by his troops, apparently because he did not get in their way. Abderrahman appears to have been like the football coach who "lets the boys play," which is a fine way of coaching as long as the team is winning. For a while Abderrahman looked like one of the greatest generals who ever lived. Relates E. S. Creasy, "The Muslims smote their enemies, passed the river Garonne, laid waste the country and took captives without number. And that army went through all places like a desolating storm. Prosperity made these warriors insatiable."[35]

The Arabs eventually reached Tours which is located about 150 miles southwest of Paris; trouble, though, was not far off. An army under Charles Martel, Duke of the Austrasian Franks,

approached the city to battle the Muslims. Abderrahman should have halted his men to analyze the situation and plan a winning strategy; however, as we previously pointed out, the commander's so-called leadership philosophy was to "let the boys play." Continues Creasy:

Abderrahman and other prudent cavaliers saw the disorder of the Muslim troops, who were loaded with spoils; but they did not venture to displease the soldiers by ordering them to abandon everything except their arms and war-horses. And Abderrahman trusted in the valor of his soldiers and in the good fortune which have ever attended them. . . So Abderrahman and his host attacked Tours to gain still more spoil, and they fought against it so fiercely that they stormed the city almost before the eyes of the army that came to save it.[36]

The promise of immediate admission into Paradise for anyone dying in battle motivated the early Muslim soldiers. But, this motivation was sorely lacking in Abderrahman's men. Instead, their battlefield efforts were generated predominately by the prospect of gaining enough spoils to make them wealthy. What subsequently befell Abderrahman's army never would have happened in 'Umar's day. The action between the Franks and Arabs commenced with both sides holding firm, though suffering many casualties, the first day:

Night parted the two armies; but in the gray of the morning the Muslims returned to the battle. Their cavaliers had soon hewn their way into the center of the Christian host. But many of the Muslims were fearful for the safety of the spoils which they had stored in their tents, and a false cry arose in their ranks that some of the enemy were plundering the camp; whereupon several squadrons of the Muslim horsemen rode off to protect their tents. But it seemed as if they fled; and all the host was troubled. While Abderrahman strove to check tumult and to lead them back to battle, the warriors of the Franks came around him, and he was pierced through with many spears, so that he died. Then all the host fled before the enemy, and many died in the flight.[37]

Historians of the Arab Empire justifiably label the Battle of Tours a "disgraceful overthrow,"[38] noting that "such defect in discipline is always fatal to armies."[39] Along these lines, successful professional football coaches such as Bill Belichick, owner of a record 6 Super Bowl Championships as coach of the New England Patriots, realize how vital discipline and maintaining one's focus is to a team and how just one mental lapse can turn what seems like certain victory into a defeat. Coach Belichick has said, "If you sit back and spend too much time feeling good about what you did in the past, you're going to come up short next time."[40] Abderrahman, however, mistakenly believed that because his soldiers had been victorious in previous battles, he could take it for granted that they would win again in the Battle of Tours and therefore didn't need to be ordered to leave their war-spoils behind and just appear at the battle with their weapons and war-horses. Another insight of Coach Belichick that Abderrahman could have benefited from knowing is this: "Talent sets the floor, character sets the ceiling."[41] Clearly, the Arab army once possessed all the attributes of a Super Bowl Championship team; but, by the Battle of Tours this proved no longer to be the case. Talent wasn't enough for Abderrahman's soldiers to defeat the Franks, for the dangers of incessantly striving for worldly gain—dangers sometimes hidden but always potent—finally caught up to the Arabs. Arsalan points his finger squarely on the problem:

The Koran has remained the same as it then was. Not a syllable has changed in the text. The change has occurred in the Muslims themselves:

Verily never
Will God change the condition
Of a people until they
Change it themselves
(With their own souls). (Koran 13:11)[42]

We saw in the preceding section how ‘Umar, when he was Caliph, ordered a canal to be built connecting the Nile to the Red Sea. A famine had struck Arabia, and his people desperately required corn from Egypt. The canal, whose length was 69 miles, was completed in 6 months. For over one hundred years it stimulated and facilitated trade between Egypt and Arabia, providing very beneficial, if not indispensable, service, much like the Panama Canal and Suez Canal do today. Unfortunately, under the Umayyads this canal “was filled up with earth here and there due to the negligence of the officers in charge,”[43] making it often unusable. Obvious evidence of a lack of maintenance of critical infrastructure is often cited as the most important sign that a nation is in decline. What happened to the Nile-to-Red Sea canal appears little different to what has developed in the United States with respect to its roads and highways. In 2022 TRIP, a national transportation nonprofit research institute, found 40% of US roads and highways to be in poor to mediocre condition. This resulted in costing a single driver on average an extra $621/year to repair and maintain his or her vehicle, with the nationwide cost of this additional vehicular repair and maintenance totaling $141 billion.[44]

In 750 CE the Umayyads were overthrown by the Abbasids, Arabs with close Persian connections. For years the Umayyads had taxed the people dry. The Abbasids, smartly, promised to reduce taxes. This pledge pleased most everyone, and the Abbasids swept into power on the back of a huge tax protest movement. Once in power, though, the Abbasids made a 180-degree turn. Instead of lowering taxes, they actually *increased* taxes over and above the exorbitant levels that the Umayyads had exacted. Though the citizenry became outraged, there was little people could do, as organizing National Tax-Limitation Committees was out of the question. For, as Glubb explains, the Abbasids were ruthless:

> It was not only the sums taken by the government which caused resentment but the greedy and tyrannical methods of the tax-collectors, who did not hesitate to employ flogging and torture to extract money from the peasants.[45]

Despite the heavy taxation and all the aggrieved citizens it created, the Arab Empire remained the leading world power under the Abbasids. But, thanks in large part to unwise social programs established by the Caliphs, this power over time became a more and more hollowed out one, for these programs ended up demotivating and lazifying much of the population. Glubb informs us that “free hospitals, free medical treatment and free education (in some places the ideal of universal education) were rapidly introduced.”[46] A story exemplifying these socialistic programs’ deadening effect on people’s self-motivation involves the great historian Jarīr Ibn Yazīd al-Tabari (839-923 CE), who should not to be confused with the physician Ali ibn Sahl al-Tabarī (whose life we have already examined). Al-Tabari was in the habit of writing 40 pages every day, a discipline he maintained for 40 years! Two books he authored, *Annals of the Apostles and the Kings* (comprising 16 volumes) and *Commentary on the Koran*, are classics. But, al-Tabari could not interest the younger generation in them. As Nicholson relates, “His pupils, we are told, flatly refused to read the first editions with him, whereupon he exclaimed: **“Enthusiasm for learning is dead!”**[47]

Abbasid rule has often been divided by historians into two periods. The first, from 750 CE to 847 CE, experienced peaceful conditions and, despite high levels of taxation, a sound, generally prosperous economy. The second period, starting in 847 CE and lasting about 400 years, was marked by civil wars, economic recessions and depressions, religious persecution, and other grave

problems. It was al-Tabari's misfortune to live the last 76 years of his long life during this second period of Abbasid rule, as being a historian he would have easily recognized that he was living during a period of societal decline. During these 400 years of decline under the Abbasids, the unimaginable became reality, as Glubb relates:

> In Iraq, contemporary writers deplored the degeneracy of the times, the indifference to religion, the increasing materialism and the laxity of sexual morals. There was much government corruption. The salary of the vizier was 5,000 gold dinars a year, but several of them accumulated great fortunes.
>
> Contemporary historians deplored the extraordinary influence acquired by popular singers over young people, resulting in a decline of sexual morality. In the second half of the tenth century, obscene sexual language, which would not have been tolerated in an earlier and stricter age, came increasingly into common use.[48]

As early as the year 800 CE, the Caliph Hārūn al-Rashīd granted "dominion status" to North Africa. Although this decentralization decision seemed reasonable and "liberal," what it really was, however, was a reflection of the timidness and impotence which now beset the Baghdad Caliphate. Within fifty years the Arab Empire had lost all its unity, for the major provinces declared their independence and were not prevented from doing so by the Baghdad authorities.

The political weakness of the Abbasids eventually adversely affected the economy of Baghdad. Traders had less reason to take their business to Baghdad since the empire was now fragmented. As a result, the city faced tight times financially. But, the way the city folk acted you would never know it: "At this moment of declining trade and financial stringency, the people of Baghdad decided to work only five days a week."[49] In the face of difficult economic conditions, the people of Baghdad should have increased the number of hours and days per week that they worked; but, the city folk went the opposite direction, being too much in the grip of the Socialist "something for nothing" mindset.

Unsurprisingly, we learn that during the last 400 years of Abbasid rule there were many people who decided that working ***no days*** per week was even better than working five days! These people called themselves Sufis, or mystics. The original Sufis did work and were not such bad guys, as Ahmad points out:

> The founders of Sufi orders, or at least most of them, were very good Muslims and followers of the Prophet, and indeed they had accepted Sufism with a pious wish of reforming the Islamic world. They hated the world and worldly things, but they did not believe in its renunciation, for they clearly realized that after renouncing it there remained no hope of reforming it.[50]

Basically, the Sufis advocated reforming oneself before reforming others. The most important holy war, they maintained, was the "struggle against one's own Demon-spirit,"[51] not military battles against the Franks or other non-Muslims. This self-purification principle, however, turned out to possess more drawbacks than advantages. Explains Ahmad:

> Its influence was far-reaching, and the character of this influence was to check and counteract the growing tendencies of the Muslims towards progress in various domains of life and activity.
>
> Even on psychological grounds this principle is not very sound. There is no possibility of setting a limit to the progress of an individual human soul. If a man decides first to develop his own soul and then to preach the Gospel of Truth to others, the time of conveying the mission to others will never come.[52]

Before long the sufis—now styling themselves "Spiritual Guides"—dropped out of the work force altogether and lived on the donations of their disciples. The disciples believed that they

were gaining God's favor by financially supporting their "Spiritual Guide," but as Ahmad points out, in reality, the disciples' pay-off actually facilitated their avoiding taking a critical self-examination of their own life and actions:

> Nobody will like to bother himself about his moral and spiritual welfare and obligations, if he can just buy them by paying a few coins or by doing homage to someone else. It takes away the feeling of personal responsibility, thus suggesting easy means of keeping away the painful consciousness of one's own sins.[53]

The Sufi movement became large and enduring, lasting around 600 years (8th through the 13th centuries CE)[54], and seriously damaged Muslim society in two ways: first, it drove "a section of intelligent and intellectual Muslims out of the economic struggle, thus decreasing the general earning capacity of the total class;"[55] secondly, it diverted "a quantity of alms towards the support of undeserving persons who could earn their livelihood by means of other productive ways. This deprived a large number of deserving and poor members of the community of the help which was their legitimate due."[56]

Now, our discussion of the Sufi movement has referred to its impact on "Muslim society" and has not mention how it impacted "Arab society." This is because the Arabs intermarried with the conquered people, and the conquered people—Persians, Berbers, Egyptians, and so on—were much more numerous than the true Arabs. As a result, the longer the Abbasids ruled, the more correct it became to use the terms "Islamic Empire/Civilization" or "Muslim society" rather than the terms "Arab Empire/Civilization" or "Arab society." After investigating this matter of the blending of different peoples, Dr. Gustave Le Bon determined that the Arabs' intermixing with the conquered people proved to be one of the main causes of their empire's and civilization's decline, stating as follows:

> This mixture of different peoples under one empire has always been a cause of dissolution. History demonstrates that it is only possible to maintain different races under one rule by observing two essential conditions: the first is that the power of the conqueror be so strong that everyone knows that all resistance is out of the question; the second is that the conqueror not intermix with the conquered, and not by consequence be absorbed by him. The Arabs never realized this second condition.[57]

The story of the Arabs' decline in Al-Andalus—i.e., the area encompassing most of modern-day Spain and Portugal—can be quickly told. When Caliph Hakam II died in 976 CE, Al-Andalus was, besides being extremely prosperous, the leading Muslim power in the world. Hakam II left a young boy, Hisham, as successor. Unfortunately, Hisham appears to have been neurologically impaired; due to both his young age and his mental disability, he was not capable of ruling. As a result, the Prime Minister, ʻAbdullāh ibn Abi ʻĀmir, ran the country. He soon acquired the same nickname— Al-Mansur, meaning "the Victorious"— enjoyed by a predecessor ruler of Al-Andalus, Caliph ʻAbd al-Rahman III. An extraordinarily skillful manipulator and palace intriguer, Al-Mansur reached his position as Prime Minister by cleverly working his way up through the ranks of the civil service, allying himself with key people, such as Hisham's mother. Once he became Prime Minister, one thing worried him: the military, for it held the real power and could easily replace him. So, Al-Mansur greatly expanded the army by recruiting Berbers, Slavs, and Christian mercenaries. After a while the Prime Minister's men outnumbered the regular soldiers, with the result being that Al-Mansur now controlled the army and owned its loyalty.

Under Al-Mansur's command the army conducted yearly military campaigns in areas controlled or threatened by the northern Christian kingdoms of Spain. Not once did Al-Mansur's troops lose. Just word of an impending invasion by "the Victorious" and his soldiers was enough to panic the hapless Christians. Needless to say, such success could not last forever. The army of Muslim Spain was no longer an Arab army, but rather a multinational one, being, in addition, now a highly-paid professional army. The Arab Empire's early armies won battles in large part because of their religious enthusiasm; but, Al-Mansur's professionals were invincible only because of their great commander who personally led and inspired them. In 1002 CE, at age 65, Al-Mansur died. No one was able to fill his shoes. The army soon stopped being paid and, as Burckhardt remarks, "these mercenary bands were to become a veritable scourge."[58] The outcome was predictable: Muslim Spain shattered into several independent kingdoms. Within thirty years the Caliphate in Al-Andalus ended, resulting in the northern Christian kingdoms initiating their slow but inexorable reconquest of the country. This process culminated in 1492 CE with the surrender of Granada, the Muslims' final outpost in Spain, to the Catholic Monarchs, King Ferdinand II of Aragon and Queen Isabella I of Castile.

Al-Mansur bought time for Muslim Spain by paying others to do what the Arabs should have been doing themselves—defending the country. Intelligent as he was, perhaps Al-Mansur believed that the Arabs had grown too soft to hold off the Christians. Whether this assessment was correct or not, the Prime Minister's creation of a multinational army composed of large numbers of mercenaries no doubt only made the Arabs in Al-Andalus less self-reliant.

By far the worst error in judgment occurring during the Middle Ages led to what some historians have regarded as being the greatest catastrophe to befall mankind. By the year 1256 CE Baghdad, though no longer capital of a powerful empire, still could claim to be the most important city in the world. Since the days of Mohammed only the Arabs and the Arabized peoples under their rule had significantly advanced the cause of world civilization; and, it was in Baghdad, primarily in its "House of Wisdom," where most of the written knowledge of the Arab Civilization was located. The "House of Wisdom", a research institution and library first established during the reign of Caliph al-Ma'mun (813-833 CE), is where one could read and study the most important written works of the Middle Ages—books and treatises presenting and detailing the Arabs' or its Arabized citizens' scientific and medical discoveries.

The year before in 1255 CE, a huge riot broke out in Baghdad between the Sunnis and Shi'ites, Islam's two main religious sects. The Sunnis apparently bested the Shi'ites, for the Vizier Ibn al-Alqamī, a Shi'ite, was so furious "that he encouraged the Tartars to invade Iraq, by which means he hoped to take ample vengeance on the Sunnis."[59] The Tartars, more commonly called Mongols, arrived the following year and defeated a small Sunni force. However, the Mongols, having granted al-Alqamī's wish of revenge, did not withdraw. Instead, they ominously pitched camp outside Baghdad, and if by now you are suspecting that extending an invitation to the Mongols to come to Baghdad was the stupidest thing one could do, you would be correct. Nicholson continues the story:

> Then the Vizier Ibn al-Alqamī said to the Caliph Musta'sim: "I will go to the Supreme Khan to arrange peace." So the hound went and obtained security for himself, and on his return said to the Caliph: "The Khan desires to marry his daughter to your son and to render homage to you, like the Seljuq kings, and then to depart." Musta'sim set out, attended by the nobles of his court and the grandees of his time, in order to witness the contract of marriage. The whole party were beheaded except the Caliph, who was

trampled to death. The Tartars entered Baghdad and distributed themselves in bands throughout the city. For thirty-four days the sword was never sheathed. Few escaped. The slain amounted to 1,800,000 and more.[60]

The fall of Baghdad and the slaughter of its residents suggests what World War III could mean to Western Civilization. The loss of life in Baghdad, of course, staggers the imagination; and, it is horrible and terrifying the manner in which the residents of this city died—being hacked and stabbed to death by raging Mongol swordsmen. But, writhing on the ground from fatal radiation burns is likely a far worse fate; and, come World War III, *billions* of people will possibly die, not a couple of million. With respect to the fate of knowledge, one must understand that in Baghdad only 1 out of every 1,000 books ended up not being destroyed by the Mongols. Throughout this book about history's greatest Preventive Medicine doctors we have examined many of the scientific and medical discoveries made by the Arabs. But keep in mind that these were discoveries whose written description somehow escaped destruction by the Mongols. We shall never know how many other tremendous advances in knowledge never came to our attention, thanks to the Mongol swordsmen. In short, the significance of Baghdad's ruination cannot be underestimated. As Abdur Rahman Khan points out in his book, *Muslim Contribution to Science and Culture*, "The Fall of Baghdad was not only a death-blow to Muslim culture, it was an immense setback to world civilization in general."[61]

Now, al-Alqamī could have tried mobilizing his city's Shi'ites to turn the tables on the Sunnis. Instead, he took the easy way out: he handed the dirty work over to the Mongols. However, the adage "you don't get something for nothing" never proved more true than in this instance. The Mongols, after dispensing with the small Sunni force that had opposed them, double-crossed the Abbasid Caliph and proceeded to slaughter Sunnis and Shi'ites alike in Baghdad while also at the same time destroying the contents of the city's irreplaceable "House of Wisdom", bringing about the Middle Ages' darkest hour.

We have covered only a fraction of the historical events which comprise the disheartening decline of the Arab Civilization during the Middle Ages. It takes little reading, though, to realize that the Arab Civilization made many of the same mistakes that the Western world is now repeating. While it would be nice to pretend that because we are supposedly a much more scientific and rational people than those who lived during the Middle Ages, and that therefore the old saying "Those who fail to learn the lessons of history are doomed to repeat it" does not apply to us, it appears that the observation of Sir John Bagot Glubb is the one realists must support:

> It is tantalizing to imagine that a more scientific study of the rise and fall of nations might enable a people of any given country to appreciate exactly where they stood in the lifespan of their race. They would thus be enabled, by noting the mistakes made by their predecessors to avoid the faults which led to their ruin. In our present stage of human development such hopes may will be illusory, for levity and triviality often seems to be typical characteristics of decadence. Nation after nation has sung, danced and trifled itself into chaos and slavery.[62]

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